REPORT RESUMES

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CONSTRUCTION CLUSTER--AN INVESTIGATION AND DEVELOPMENT OF THE CLUSTER CONCEPT AS A PROGRAM IN VOCATIONAL EDUCATION AT THE SECONDARY SCHOOL LEVEL.

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THIS COURSE OUTLINE IN CONSTRUCTION IS PART OF THE FINAL REPORT ON "CLUSTER CONCEPT" COURSES IN VOCATIONAL EDUCATION FOR SECONDARY EDUCATION (ED 010 301). EACH JOB ENTRY TASK WAS ANALYZED FOR HUMAN REQUIREMENTS (COMMUNICATION, MEASUREMENT, MATHEMATICS, SCIENCE, SKILLS, AND INFORMATION) NECESSARY TO PERFORMANCE OF THE TASK. THE TASK STATEMENTS FOR CARPENTRY, ELECTRICITY, MASONRY, PAINTING, AND PLUMBING WERE WRITTEN IN BEHAVIORAL TERMS WHICH PROVIDE THE INSTRUCTOR WITH A DESCRIPTION OF WHAT THE STUDENT SHOULD BE ABLE TO DO AFTER HE HAS HAD THE LEARNING EXPERIENCE. INSTRUCTIONAL SEQUENCES WERE PROVIDED AT THE END OF THE TASK ANALYSIS SECTION TO AID THE TEACHER IN DEVELOPING LESSON PLANS, MATERIALS OF INSTRUCTION, AND VISUAL AIDS. (FOR OTHER COURSE OUTLINES SEE ED 010 303 AND ED 010 304.) (GC)

ED010302

FINAL REPORT

(One of Four Volumes)

AN INVESTIGATION AND DEVELOPMENT OF THE CLUSTER CONCEPT AS A PROGRAM IN VOCATIONAL EDUCATION AT THE SECONDARY SCHOOL LEVEL

UNIVERSITY OF MARYLAND
COLLEGE PARK, MARYLAND

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INTRODUCTION

The volume for the occupational cluster of Construction is the result of the research procedures which are described in Part III of the final report volume. The research initially involved the identification of tasks which are required for entry into the occupations found in the Construction Cluster. These tasks are classified into two categories:

Level I - Those tasks which are needed immediately upon job entry.

Level II- Those tasks which are not needed immediately for job entry into an occupation, but will be needed soon after entering the occupation.

Each job entry task was then analyzed with respect to the areas of human requirement (communication, measurement, mathematics, science, skills and information) which are necessary for the performance of the task. The task statements and the areas of human requirement are written in behavioral terms which provide the instructor with a description of what the student should be able to do after he has had the learning experience.

The areas of human requirement that are common to the occupations included in the Construction Cluster have been determined and are identified in the task analysis section in the following manner:

Δ Common to all occupations

* Common to more than one occupation

ø Common within the occupation

A suggested instructional sequence for each task is provided for the teacher at the end of the task analysis section. The task

is shown at the top of the page with the headings for the areas of human requirement listed below the task. Under each heading the behavioral statements have been arranged in a suggested instructional sequence. The arrangement provides the teacher with an instructional pattern that can also be used to develop lesson plans, materials of instruction and visual aids.

A course outline has been developed for each occupation in the Construction Cluster. The outlines are based upon an analysis of the job entry tasks and the identification of common areas of human requirement.

JOB ENTRY TASKS

CONSTRUCTION

A list of tasks have been identified in this section of the report that are needed for entry into the occupations included in the construction cluster. The job entry tasks for the cluster are classified into two categories:

Level I - those tasks which are needed immediately upon job entry.

Level II - those tasks which are not needed immediately for job entry into an occupation, but will be needed soon after entering the occupation.

LEVEL I JOB ENTRY TASKS

Carpentry

Task No.	Task Statements
1.	Mixing mortar for mudsills of a house.
2.	Constructing a saw horse and trestle for use on construction site.
4.	Erecting girders and columns for a house.
6.	Installing hangers and anchors for floor joists for a house.
8.	Installing cross bridging between floor joists for a house.
9.	Installing solid bridging between floor joists for a house.
10.	Laying subfloors on floor joists for a house.
16.	Applying lap, plywood or composition sheathing for a house.
17.	Installing fire stops along plate in a house.
22.	Laying roof decking for a house.
23.	Applying building paper to sidewall, rough floor or roof deck on a house.
24.	Building a foot rest for shingling a roof on a house.
26.	Applying roll roofing for a house.
31.	Installing blanket, bulk, batt, rigid and metallic insulation in a house.
32.	Installing backing to an interior wall of a house.
33.	Applying commercial wall board to the interior of a house.
35.	Applying lath to house studding.

Electricity

1.	Installing boxes for receptacles, switches, junctions and fixtures in a house.
2.	Installing wiring from box to box in a house.

3. Connecting receptacles, single throw switches, fixtures and pilot lights to complete circuits in a house.

5. Installing rigid, thin wall and flexible conduit in a house.

Masonry

1. Setting up a work area in order to expedite the mixing of concrete on the job.

2. Cleaning and oiling concrete forms prior to and after use on a building.

4. Shoring sidewalls of earthen ditches to prevent cave-ins during excavation.

6. Wiring and bolting forms to prevent spreading during pouring.

8. Installing anchor bolts in masonry walls and concrete to provide a place for securing future construction.

9. Protecting a concrete slab following finishing operations to provide for proper curing.

10. Erecting scaffolding for use by a mason at the building site.

11. Cleaning out mortar joints for tuck pointing on a masonry wall.

12. Pointing up a section of a brick wall to provide a finished appearance on a house.

13. Applying colorless coating to waterproof masonry surfaces above grade on a building.

14. Applying asphalt coating to waterproof foundation wall below grade on a building.

15. Pouring a section of footing containing reinforcing rods for a house.

16. Pouring a small reinforced concrete slab suitable for a porch deck on a house.

Painting

1. Preparing a surface for application of stain on the interior or exterior of a house.

2. Preparing a surface for application of paint on the interior or exterior of a house.
4. Removing old finishes in preparation for resurfacing.
5. Preparing stain and applicator for use on the interior and exterior of a house.
7. Preparing clear finishes and applicators for use on the exterior and interior of a house.
8. Cleaning and storing brushes and rollers following their use in applying finishing materials.
9. Glazing a window in preparation for painting.
10. Preparing joints and nail holes in dry wall construction to receive final finish.
11. Applying finishing materials to provide protection and decoration of surfaces in or on a house.

Plumbing

1. Digging a trench for plumbing installation in a house.
2. Backfilling a trench following installation of plumbing lines for a house.
3. Preparing copper tubing for installation in a plumbing system for a house.
4. Preparing pipe for installation in a plumbing or gas supply system in a house.
5. Preparing cast iron soil pipe to pour a lead joint for a waste line in a house.
6. Preparing lead for pouring soil pipe joints for a house.
7. Laying a drainage field with clay pipe for a house.
8. Attaching mounting brackets for plumbing fixtures to frame construction.
9. Attaching mounting brackets for plumbing fixtures to masonry construction.
10. Installing a water closet seat in a house.
11. Insulating heating and water lines in a house.

12. Assembling a furnace for a house.

13. Installing duct work for warm air heating system in a house.

19. Welding angle iron for pipe hangers.

LEVEL II JOB ENTRY TASKS

Carpentry

Task No.	Task Statements
3.	Cutting building material to length for a house.
5.	Framing a box sill for a house.
7.	Erecting floor and ceiling framing joists for a house.
11.	Framing bathroom floors for a tile floor in a house.
12.	Building up corner posts for corner of framing in a house.
13.	Laying out stud spacing for walls and partition.
14.	Assembling walls and partitions for a frame house.
15.	Erecting wall sections for a house.
18.	Installing staging brackets for house construction.
19.	Installing single and double post scaffolding for house construction.
20.	Framing a flat roof for a house.
21.	Installing gable studs for a house.
25.	Installing metal drip edge on roof for a house.
27.	Applying sheet metal roofing to a house.
28.	Applying built-up roofing to a house.
29.	Installing a hanging gutter to a house roof.
30.	Fastening wood to masonry with fasteners in a house.
34.	Installing furring and grounds to interior of a house.

36. Applying corner boards on a house.

37. Assembling basement stairs for a house.

38. Erecting roof and deck framing for a house porch.

39. Laying porch floors for a house.

Electricity

4. Erecting a temporary service pole for portable electric equipment used in building.

6. Installing a separate circuit for an electric range in a house.

7. Installing grounds for a house wiring system.

8. Installing entrance cable on the exterior of a house.

9. Installing low voltage operated bells and signalling devices in a house.

10. Connecting a hot water heater to a power source in a house.

11. Connecting a water pump to a power source in a house.

12. Installing an attic fan or room cooler in a house.

Masonry

3. Preparing a batch of cement, plaster, lime mortar and cement-lime mortar by hand and by machine at the construction site.

5. Installing rods and spreaders to space form section before pouring cement.

7. Bracing sidewalls of forms to prevent spreading during pouring.

17. Installing footer forms to receive concrete for a foundation.

18. Setting a section of sidewalk form to receive concrete at a building site.

19. Finishing a small concrete slab to provide utility and pleasing appearance.

20. Laying cement block for a wall in stretcher courses for a building.

21. Laying up the following bonds without mortar to illustrate a basic knowledge of each (running, common, Flemish, English, basket weave).

Painting

3. Preparing a surface for application of a clear finish on the interior or exterior of a house.

6. Preparing paint and applicator for use in painting a house.

Plumbing

14. Installing plastic pipe for plumbing lines for a house.

15. Soldering sheet metal and copper tubing to be used in a house.

16. Repairing leaks in faucets in a house.

17. Repairing leaks in a water closet in a house.

18. Cleaning waste lines with a snake in a house.

TASK ANALYSIS

CONSTRUCTION

This section of the report identifies the results of an analysis of the job entry tasks with respect to the areas of human requirement (communication, measurement, mathematics, science, skills, and information) needed for the performance of the tasks. The task statements and the areas of human requirement are written in behavioral terms which provide the instructor with a description of what the student should be able to do after he has had the learning experience. The areas of human requirement that are common to the occupations in the cluster have been determined and are identified in the following manner:

Δ Common to all occupations.

* Common to more than one occupation.

ø Common within the occupation.

CARPENTRY

TASK 1: MIXING MORTAR (GROUNTING) FOR MUDSILLS OF A HOUSE

COMMUNICATION

Δ 1. Reading instructions on container to determine mix proportions.

* 2. Receiving verbal instruction from the contractor as to consistency of mix.

MATHEMATICS

* 1. Halving, doubling, tripling, etc. the proportions to suit the quantity needed.

SKILLS

* 1. Mixing equal proportions of ingredients to a fairly good "running" consistency with a hoe.

* 2. Cleaning the tools with water and a wire brush after use.

INFORMATION

1. Explaining necessity of measuring ingredients accurately.

Δ 2. Protecting oneself by wearing:

   a. Safety glasses
   b. Safety shoes
   c. Gloves

TASK 2: CONSTRUCTING A SAW HORSE AND TRESTLE FOR USE ON CONSTRUCTION SITES

COMMUNICATION

* 1. Reading a blueprint to determine size and construction of saw horse.

MEASUREMENT

Δ 1. Measuring size of material with a rule to an accuracy of 1/16 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

SCIENCE

Δ 1. Explaining the importance of grounding electric tools.

SKILLS

* 1. Laying out angles for the legs with a framing square to an accuracy of 1/16 of an inch.

* 2. Cutting trestle and legs to length with a cross cut, radial arm, or portable saw to an accuracy of 1/16 of an inch.

Δ 3. Nailing parts together with a hammer to an accuracy of 1/16 of an inch.

Δ 4. Removing bent nails with a bar or hammer.

INFORMATION

1. Checking saw horse on level surface to see if legs are of equal length.

Δ 2. Using electric power tools safely.

Δ 3. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 4. Protecting oneself by wearing:

    a. Safety glasses
    b. Safety shoes

TASK 3: CUTTING BUILDING MATERIAL TO LENGTH FOR A HOUSE

COMMUNICATION

* 1. Reading blueprint to determine (1) sizes and (2) material.

MEASUREMENT

Δ 1. Measuring stock to length with a tape to an accuracy of 1/16 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

* 2. Adding and subtracting from dimensions on a drawing or actual placement to determine the required length.

SCIENCE

Δ 1. Explaining the importance of grounding electric tools.

SKILLS

* 1. Marking proper length, square with one edge using a framing square to an accuracy of 1/16 of an inch.

2. Constructing a fixture for cutting multiple pieces the same to an accuracy of 1/16 of an inch.

* 3. Operating a portable power saw, a hand cross cut saw, a radial arm saw to an accuracy of 1/16 of an inch.

INFORMATION

1. Recognizing various types of materials.

2. Measuring the total length in one step rather than in multiples of shorter measurements.

Δ 3. Using electric power tools safely.

Δ 4. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 5. Protecting oneself by wearing:
   a. Safety glasses
   b. Safety shoes
   c. Gloves

TASK 4: ERECTING GIRDERS AND COLUMNS FOR A HOME

COMMUNICATION

* 1. Reading a blueprint to determine location and size or height-allowance for bearing plates and/or bolsters if used.

MEASUREMENT

Δ 1. Measuring girders and columns for proper length to an accuracy of 1/16 of an inch.

SCIENCE

1. Explaining the span limits of wooden structural members.

Δ 2. Explaining the importance of grounding electric tools.

* 3. Laying out square and bevel cuts with a framing square to an accuracy of 1/16 of an inch.

SKILLS

* 1. Beveling the end cut on the girder with a hand saw, or portable power saw.

Δ 2. Fastening joints with hammer and nails to an accuracy of 1/16 of an inch.

Δ 3. Removing bent nails with a bar or hammer.

* 4. Placing bearing plates with screws and screwdriver on the girder to an accuracy of 1/16 of an inch.

* 5. Leveling the girder with a level.

Δ 6. Placing temporary supports to hold columns vertical with a hammer.

* 7. Plumbing the column with a level.

INFORMATION

1. Explaining the prevention of rot in pockets at ends of girder.

2. Explaining why girders are crowned.

3. Explaining the nailing pattern used in building up a girder.

Δ 4. Using electric power tools safely.

Δ 5. Demonstrating safe use of a step ladder.

Δ 6. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 7. Protecting oneself by wearing:

  a. Safety glasses
  b. Safety shoes
  c. Safety helmets

TASK 5: FRAMING A BOX SILL (SILL PLATE AND HEADER) FOR A HOME

COMMUNICATION

* 1. Reading a blueprint to determine sizes, length and location of sills, joists, and rim joists (sometimes headers).

MEASUREMENT

Δ 1. Measuring stock to length with a tape to an accuracy of 1/16 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing, in order to economically cut stock to correct lengths.

SCIENCE

Δ 1. Explaining the importance of grounding electric tools.

SKILLS

* 1. Laying out stock with a rule and framing square to an accuracy of 1/16 of an inch.

* 2. Cutting joists to required length with a hand saw or power saw accurate to 1/16 of an inch.

* 3. Marking rim joists with tape, pencil and framing square for placement of floor joists to an accuracy of 1/16 of an inch.

* 4. Drilling holes in sill plate by hand or with an electric drill.

* 5. Mounting sill plate on the masonry with adjustable wrench to an accuracy of 1/16 of an inch.

INFORMATION

* 1. Using an adjustable wrench properly.

Δ 2. Using electric power tools safely.

Δ 3. Demonstrating safe use of a step ladder.

Δ 4. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 5. Protecting oneself by wearing:

a. Safety glasses
b. Safety shoes
c. Gloves

TASK 6: INSTALLING HANGERS AND ANCHORS FOR FLOOR JOISTS

COMMUNICATION

* 1. Reading blueprints to determine type and placement of hangers and anchors.

MEASUREMENT

Δ 1. Measuring for placement with a tape or folding rule accurate to 1/32 of an inch.

SCIENCE

Δ 1. Explaining the importance of grounding electric tools.

SKILLS

* 1. Marking bolt holes on joists for anchor or hanger with a rule and square to an accuracy of 1/32 of an inch.

* 2. Boring holes in joists with electric drill or by hand.

* 3. Securing anchor or hanger in place with adjustable wrench.

4. Nailing hanger or anchor in proper location with a hammer.

Δ 5. Removing bent nails with a bar or hammer.

INFORMATION

* 1. Using an adjustable wrench properly.

Δ 2. Using electric power tools safely.

Δ 3. Demonstrating safe use of a step ladder.

Δ 4. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 5. Protecting oneself by wearing:

a. Safety glasses
b. Safety shoes
c. Safety helmets
d. Gloves

TASK 7: ERECTING FLOOR AND CEILING FRAMING JOISTS FOR A HOME

COMMUNICATION

* 1. Reading a blueprint to determine length and placement of joists.

MEASUREMENT

Δ 1. Measuring joists for length and placement with a folding rule or tape to an accuracy of 1/16 of an inch.

SKILLS

* 1. Checking the ends of joists for squareness with a framing square to an accuracy of 1/16 of an inch.

* 2. Marking the location of joists on the header by squaring up lines from the sill with a framing square to an accuracy of 1/16 of an inch.

ø 3. Laying out joists on location with all crowns facing in the same direction.

Δ 4. Nailing joists into rim joists and sill with a hammer to an accuracy of 1/16 of an inch.

Δ 5. Removing bent nails with a bar or hammer.

INFORMATION

1. Providing for foundation ventilation according to local code.

Δ 2. Demonstrating safe use of a step ladder and extension ladder.

Δ 3. Protecting oneself by wearing:

    a. Safety glasses
    b. Safety shoes
    c. Safety helmets
    d. Gloves

TASK 8: INSTALLING CROSS BRIDGING BETWEEN FLOOR JOISTS FOR A HOUSE

COMMUNICATION

* 1. Reading a blueprint to determine type of stock to be used, location, and the number of rows.

SCIENCE

ø 1. Explaining the strength gained by the use of triangular structures.

SKILLS

Δ 1. Starting nails with a hammer in both ends before installing.

Δ 2. Nailing bridging with a hammer on top end only (bottom nailed after flooring is laid) to an accuracy of 1/8 of an inch.

Δ 3. Removing bent nails with a bar or hammer.

INFORMATION

ø 1. Explaining how bridging stiffens floors.

ø 2. Explaining how bridging distributes the load.

ø 3. Explaining how bridging holds joists in alignment.

ø 4. Explaining how bridging helps prevent warping.

ϕ 5. Explaining when bridging should be nailed in place.

6. Demonstrating safe use of a step ladder.

Δ 7. Protecting oneself by wearing:

   a. Safety glasses
   b. Safety shoes
   c. Safety helmets

TASK 9: INSTALLING SOLID BRIDGING BETWEEN FLOOR JOISTS FOR A HOUSE

COMMUNICATION

* 1. Reading a blueprint to determine type of stock to be used, location, and the number of rows.

SCIENCE

ϕ 1. Explaining the strength gained by the use of triangular structures.

SKILLS

1. Offsetting bridging for easy nailing.

Δ 2. Nailing bridging into place with a hammer to an accuracy of 1/8 of an inch.

Δ 3. Removing bent nails with a bar or hammer.

INFORMATION

ϕ 1. Explaining how bridging stiffens floors.

ϕ 2. Explaining how bridging distributes the load.

ϕ 3. Explaining how bridging holds joists in alignment.

ϕ 4. Explaining how bridging helps prevent warping.

ϕ 5. Explaining when bridging should be nailed in place.

6. Demonstrating safe use of a step ladder.

Δ 7. Protecting oneself by wearing:

- a. Safety glasses
- b. Safety shoes
- c. Safety helmets

TASK 10: LAYING SUBFLOORS ON FLOOR JOISTS

COMMUNICATION

* 1. Reading a blueprint to determine type, thickness, and width of subflooring; also to determine the direction of boards (either squarely or diagonally across).

MEASUREMENT

Δ 1. Measuring placement of first board with a tape or folding rule to an accuracy of 1/16 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing, in order to economically cut stock to correct lengths.

SCIENCE

1. Explaining the importance of grounding electric tools.

SKILLS

1. Placing boards on the joists to allow for expansion caused by swelling.

ϕ 2. Staggering the joints of the flooring boards for strength.

Δ 3. Nailing subflooring to floor joists with a hammer to an accuracy of 1/16 of an inch.

ϕ 4. Pulling cracked boards into place with a prybar.

* 5. Squaring cross joint blocks with a framing square to an accuracy of 1/16 of an inch.

* 6. Cutting cross-joint blocks (for plywood) with a cross cut saw or radial arm saw to an accuracy of 1/16 of an inch.

Δ 7. Nailing (toenailed) cross joint blocks into joists on both ends with a hammer to an accuracy of 1/16 of an inch.

Δ 8. Removing bent nails with a bar or hammer.

INFORMATION

ø 1. Recognizing different materials used in subflooring.

ø 2. Recognizing different thicknesses of materials and for what they are used.

ø 3. Demonstrating two methods of laying.

ø 4. Demonstrating nailing pattern for plywood.

Δ 5. Using electric power tools safely.

Δ 6. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 7. Protecting oneself by wearing:

a. Safety glasses
b. Safety shoes
c. Safety helmets
d. Gloves

TASK 11: FRAMING BATHROOM FLOORS FOR A TILE FLOOR

COMMUNICATION

* 1. Reading a drawing to determine method to be used in dropping floor.

MEASUREMENT

Δ 1. Measuring for placement of nailing strip or furring to an accuracy of 1/16 of an inch.

MATHEMATICS

* 1. Adding and subtracting dimensions from the blueprint to determine the amount of recess for bathroom floor.

* 2. Adding, subtracting, multiplying, dividing, in order to economically cut stock to correct lengths.

SCIENCE

Δ 1. Explaining the importance of grounding electric tools.

SKILLS

* 1. Laying out stock with a framing square and rule to an accuracy of 1/16 of an inch.

* 2. Cutting framing material to length with a hand or power saw to an accuracy of 1/16 of an inch.

Δ 3. Nailing joists into place with a hammer to an accuracy of 1/16 of an inch.

Δ 4. Installing nailing strips and/or furring strips with a hammer to an accuracy of 1/16 of an inch.

Δ 5. Removing bent nails with a bar or hammer.

6. Drilling holes with an electric drill.

INFORMATION

1. Explaining the different methods of recessing a tile bathroom floor.

Δ 2. Using electric power tools safely.

Δ 3. Demonstrating safe use of a step ladder.

Δ 4. Protecting oneself by wearing:

    a. Safety glasses
    b. Safety shoes

TASK 12: BUILDING UP CORNER POSTS FOR CORNERS OF FRAMING

COMMUNICATION

* 1. Reading a blueprint to determine method of building the corner post and partition post.

MEASUREMENT

Δ 1. Measuring the length of stock (usually 2 x 4) with a tape or folding rule to an accuracy of 1/16 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to proper lengths.

SCIENCE

Δ 1. Explaining the importance of grounding electric tools.

SKILLS

* 1. Squaring stock with a framing square to an accuracy of 1/16 of an inch.

* 2. Cutting material to length with a cross cut saw, portable hand saw, or radial arm saw to an accuracy of 1/16 of an inch.

Δ 3. Nailing parts together with a hammer to form post to an accuracy of 1/16 of an inch.

Δ 4. Removing bent nails with a bar or hammer.

INFORMATION

1. Recognizing various methods of constructing corner posts.

Δ 2. Using electric power tools safely.

Δ 3. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 4. Protecting oneself by wearing:

a. Safety glasses
b. Safety shoes
c. Gloves

TASK 13: LAYING OUT STUD SPACING FOR WALLS AND PARTITIONS

COMMUNICATION

* 1. Reading blueprint to determine stud spacing and starting corner.

MEASUREMENT

Δ 1. Measuring stud spacing with a rule to an accuracy of 1/16 of an inch.

MATHEMATICS

* 1. Adding and subtracting to determine stud placement for openings.

SKILLS

* 1. Marking off exact location of studs, with a framing square.

* 2. Laying sole and plate side by side and squaring stud location across both pieces at the same time with a framing square.

INFORMATION

Δ 1. Protecting oneself by wearing safety shoes.

TASK 14: ASSEMBLING WALLS AND PARTITIONS FOR A FRAME HOUSE

COMMUNICATION

* 1. Reading a blueprint to determine location and sizes of openings.

2. Reading marks placed on stock by the contractor.

SKILLS

1. Laying out stock pieces on the floor according to a blueprint or drawing.

* 2. Squaring the members with a framing square to an accuracy of 1/16 of an inch.

Δ 3. Nailing members together with a hammer to an accuracy of 1/16 of an inch.

Δ 4. Removing bent nails with a bar or hammer.

INFORMATION

1. Recognizing the proper size nails to be used.
2. Demonstrating various ways of framing a partition or wall.

Δ 3. Protecting oneself by wearing:

   a. Safety glasses
   b. Safety shoes
   c. Safety helmets

TASK 15: ERECTING (RAISE), PLUMBING AND BRACING WALL SECTIONS FOR A HOUSE

COMMUNICATION

* 1. Receiving verbal instructions from the contractor.

SKILLS

1. Raising partition in up-right position from floor by hand.

Δ 2. Nailing sole plate through subfloor into floor joists or header with a hammer to an accuracy of 1/16 of an inch.

* 3. Plumbing partitions with a level.

Δ 4. Nailing on temporary diagonal bracing with a hammer for support.

Δ 5. Removing bent nails with a bar or hammer.

INFORMATION

Δ 1. Protecting oneself by wearing:

   a. Safety glasses
   b. Safety shoes
   c. Safety helmets
   d. Gloves

TASK 16: APPLYING SHEATHING (LAP, PLYWOOD OR COMPOSITION) FOR A HOUSE

COMMUNICATION

* 1. Reading a blueprint to determine the type, method of application, and size of sheathing.

MEASUREMENT

Δ 1. Measuring boards to length with a folding rule or tape to an accuracy of 1/16 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

SCIENCE

Δ 1. Explaining the importance of grounding electric tools.

SKILLS

* 1. Laying out square and diagonal cuts with a framing square to an accuracy of 1/16 of an inch.

* 2. Cutting boards to length with a cross cut saw, portable hand saw, or radial arm saw to an accuracy of 1/16 of an inch.

Δ 3. Nailing boards to framing members with a hammer to an accuracy of 1/16 of an inch.

Δ 4. Removing bent nails with a bar or hammer.

ϕ 5. Staggering joints of sheathing boards for strength.

INFORMATION

ϕ 1. Recognizing the various thickness and widths of horizontal or diagonal board sheathing.

ϕ 2. Recognizing the various types of sheathing.

ϕ 3. Recognizing the various methods of installation.

ϕ 4. Handling sheathing with care in windy weather.

ø 5. Demonstrating nailing pattern for plywood.

Δ 6. Demonstrating safe use of a step ladder and an extension ladder.

Δ 7. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 8. Using electric power tools safely.

Δ 9. Protecting oneself by wearing:

  a. Safety glasses
  b. Safety shoes
  c. Safety helmets
  d. Gloves

TASK 17: INSTALLING FIRE STOPS ALONG PLATE IN A HOUSE

COMMUNICATION

* 1. Reading a blueprint to determine the size and location of fire stops or blocks.

MEASUREMENT

Δ 1. Measuring between studs or roof rafters with a folding rule, tape or framing square to an accuracy of 1/16 of an inch.

SCIENCE

Δ 1. Explaining the importance of grounding electric tools.

SKILLS

* 1. Squaring stock to size with a framing square to an accuracy of 1/16 of an inch.

* 2. Cutting stops to length with a hand saw, radial arm saw or portable hand saw to an accuracy of 1/16 of an inch.

Δ 3. Nailing stops into place with a hammer to an accuracy of 1/16 of an inch.

Δ 4. Removing bent nails with a bar or hammer.

INFORMATION

Δ 1. Demonstrating safe use of a step ladder and an extension ladder.

Δ 2. Using electric power tools safely.

Δ 3. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 4. Protecting oneself by wearing:

  a. Safety glasses
  b. Safety shoes
  c. Safety helmets

TASK 18: INSTALLING STAGING BRACKETS FOR HOUSE CONSTRUCTION

MEASUREMENT

Δ 1. Measuring the height of the brackets with a tape or folding rule from a reference to an accuracy of 1/8 of an inch.

SCIENCE

ϕ 1. Explaining the strength gained by use of triangular structures.

Δ 2. Explaining the importance of grounding electric tools.

SKILLS

* 1. Boring a hole in backing plate with an electric drill or bit brace.

Δ 2. Nailing a backing plate onto studs with a hammer to an accuracy of 1/8 of an inch.

Δ 3. Removing bent nails with a bar or hammer.

* 4. Leveling between brackets with a level and straight edge to an accuracy of 1/8 of an inch.

Δ 5. Securing bracket with lag screws, nails, or wing nuts to an accuracy of 1/8 of an inch.

INFORMATION

1. Recognizing various types of brackets.

2. Explaining various methods of attaching brackets to a house.

* 3. Using an adjustable wrench properly.

Δ 4. Demonstrating safe use of a step ladder and an extension ladder.

Δ 5. Using electric power tools safely.

Δ 6. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 7. Protecting oneself by wearing:

   a. Safety glasses
   b. Safety shoes
   c. Safety helmets

TASK 19: INSTALLING SINGLE AND DOUBLE POST SCAFFOLDING FOR HOUSE CONSTRUCTION

COMMUNICATION

* 1. Receiving verbal instructions or sketches of type, size and materials to be used on the scaffold.

MEASUREMENT

Δ 1. Measuring heights for ledgers with a tape or folding rule to an accuracy of 1/8 of an inch.

SCIENCE

1. Explaining forces absorbed by diagonal braces.

Δ 2. Explaining the importance of grounding electric tools.

SKILLS

* 1. Cutting blocks with a hand saw or power saw to an accuracy of 1/4 of an inch.

* 2. Placing blocks to prevent posts from sinking.

* 3. Plumb posts with a level.

* 4. Securing scaffold to wall with nails or diagonal bracing.

Δ 5. Nailing on toeboards with a hammer.

6. Laying planks across ledgers.

Δ 7. Nailing on a handrail with a hammer.

* 8. Sharpening stakes with a saw or axe.

* 9. Driving stakes into ground for stability with a sledge hammer.

Δ10. Attaching braces to stakes and scaffold with a hammer.

Δ11. Removing bent nails with a bar or hammer.

INFORMATION

* 1. Checking lumber for defects prior to using.

2. Explaining different types of scaffolding.

* 3. Understanding that scaffold must support worker plus materials.

Δ 4. Using electric power tools safely.

Δ 5. Demonstrating safe use of a step ladder and an extension ladder.

Δ 6. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 7. Protecting oneself by wearing:

a. Safety glasses
b. Safety shoes
c. Safety helmets
d. Gloves

TASK 20: FRAMING A FLAT ROOF FOR A HOME

COMMUNICATION

* 1. Reading a blueprint to determine the size of stock, weather overhang, method of sloping roof (tapered joists or cant strips) and spacing of joists.

MEASUREMENT

Δ 1. Measuring stock to length with a tape to an accuracy of 1/16 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing, in order to economically cut stock to correct lengths.

SCIENCE

Δ 1. Explaining the importance of grounding electric tools.

SKILLS

* 1. Laying out square and angle cuts with a framing square to an accuracy of 1/16 of an inch.

* 2. Cutting roof joists, look out rafters, and double headers to length with a portable hand saw or radial arm saw to an accuracy of 1/16 of an inch.

* 3. Cutting tapers on overhang portion of joists with a portable hand saw or radial arm saw.

ø 4. Laying joist and double header with crowns facing one direction on wallplates.

Δ 5. Securing joists to wallplates with hammer and nails to an accuracy of 1/16 of an inch.

Δ 6. Nailing look out rafters into wallplate and header with a hammer to an accuracy of 1/16 of an inch.

Δ 7. Nailing on rim joists to joists with a hammer to an accuracy of 1/16 of an inch.

Δ 8. Removing bent nails with a bar or hammer.

INFORMATION

1. Explaining the various methods of sloping a flat roof.

Δ 2. Using electric power tools safely.

Δ 3. Demonstrating safe use of a step ladder and an extension ladder.

Δ 4. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 5. Protecting oneself by wearing:

   a. Safety glasses
   b. Safety shoes
   c. Safety helmets
   d. Gloves

TASK 21: INSTALLING GABLE STUDS FOR A HOUSE

COMMUNICATION

* 1. Reading a blueprint to determine the location of studs in end gable.

SKILLS

1. Placing gable studs directly over wall studs on plate.

* 2. Plumbing studs with a level.

Δ 3. Nailing studs into place with a hammer to an accuracy of 1/16 of an inch.

Δ 4. Removing bent nails with a bar or hammer.

INFORMATION

1. Explaining the two types of gable end studs (gable end stud and notched gable end studs).

Δ 2. Demonstrating safe use of a step ladder and an extension ladder.

Δ 3. Protecting oneself by wearing safety glasses.

TASK 22: LAYING ROOF DECKING FOR A HOUSE

COMMUNICATION

* 1. Reading a blueprint to determine the type, method and size of decking.

MEASUREMENT

Δ 1. Measuring boards to length with a folding rule or tape to an accuracy of 1/16 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct length.

SCIENCE

Δ 1. Explaining the importance of grounding electric tools.

SKILLS

* 1. Laying out square or diagonal cuts with a framing square to an accuracy of 1/16 of an inch.

* 2. Cutting boards to length with a cross cut saw, portable hand saw, or radial arm saw to an accuracy of 1/16 of an inch.

Δ 3. Nailing boards to the rafters with a hammer to an accuracy of 1/16 of an inch.

ϕ 4. Staggering the joints of the sheathing boards for strength.

Δ 5. Removing bent nails with a bar or hammer.

INFORMATION

ϕ 1. Explaining the various thicknesses and widths of horizontal or diagonal decking.

ϕ 2. Demonstrating proper nailing pattern for plywood.

ϕ 3. Explaining the various types of decking.

Δ 4. Using electric power tools safely.

ø 5. Explaining the various methods of installation.

Δ 6. Demonstrating safe use of a step ladder and extension ladder.

Δ 7. Protecting oneself by wearing:

   a. Safety glasses
   b. Safety shoes

TASK 23: APPLYING BUILDING PAPER TO SIDEWALL, ROUGH FLOOR OR ROOF DECK

COMMUNICATION

* 1. Reading a blueprint to determine type and method of fastening paper.

MEASUREMENT

Δ 1. Measuring paper to length with a rule accurate to the nearest inch.

SKILLS

1. Unrolling paper on wall, floor, roof.

ø 2. Cutting the paper to length with a knife accurate to the nearest inch.

Δ 3. Fastening the paper to the sheathing with a hammer or staple hammer.

4. Eliminating large wrinkles by cutting them with a knife and re-stapling them.

INFORMATION

1. Explaining purposes:

   a. Waterproofing
   b. Reducing infiltration of air and dust
   c. Provide quieter floor

Δ 2. Demonstrating safe use of a step ladder and extension ladder.

3. Explaining different classifications:
    a. Tarred felt
    b. Asphalt saturated
    c. Paraffin saturated
    d. Laminated kraft
    e. Machine finish
    f. Foil

Δ 4. Protecting oneself by wearing:
    a. Safety shoes
    b. Gloves

TASK 24: BUILDING FOOT REST FOR SHINGLING A ROOF

COMMUNICATION

* 1. Receiving verbal or written instructions (drawing) for a foot rest, foot lock, or roof bracket.

MEASUREMENT

Δ 1. Measuring building materials to size with a ruler to an accuracy of 1/16 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

SCIENCE

Δ 1. Explaining the importance of grounding electric tools.

SKILLS

* 1. Squaring cuts with a framing square to an accuracy of 1/16 of an inch.

* 2. Cutting wood to size with a hand or power saw to an accuracy of 1/16 of an inch.

Δ 3. Attaching metal roof brackets to a roof with a hammer to an accuracy of 1/8 of an inch.

4. Anchoring ladder to roof with rope attached to other side of house

5. Anchoring ladder to roof with a brace at the peak of roof.

Δ 6. Constructing a cleated board with a brace to hold it to the peak of a roof using a hammer and saw.

Δ 7. Removing bent nails with a bar or hammer.

8. Placing a cross piece or foot rest across roof supports.

INFORMATION

1. Wearing the proper type (non-skid) shoes.

2. Explaining different methods of constructing a foot rest.

Δ 3. Using electric power tools safely.

Δ 4. Demonstrating safe use of a step ladder and extension ladder.

Δ 5. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 6. Protecting oneself by wearing:

    a. Safety glasses
    b. Safety helmets
    c. Gloves

TASK 25: INSTALLING A METAL DRIP EDGE ON A ROOF FOR A HOME

MEASUREMENT

Δ 1. Measuring the length of the edge of the roof with a tape to an accuracy of 1/16 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

SKILLS

* 1. Squaring cuts with a framing square to an accuracy of 1/16 of an inch.

* 2. Cutting the metal to length with a fine toothed hacksaw or with metal (tin) snips to an accuracy of 1/16 of an inch.

Δ 3. Nailing metal in place with a hammer to an accuracy of 1/16 of an inch.

Δ 4. Removing bent nails with a bar or hammer.

5. Fitting the end of one piece of drip edge to another.

INFORMATION

1. Positioning nails so they enter framing members of roof.

2. Explaining importance of using nails no longer than thickness of roof boards when drip edge cannot be nailed to framing members.

3. Explaining the reason for installing drip edge over building paper.

Δ 4. Demonstrating safe use of a step ladder and an extension ladder.

Δ 5. Protecting oneself by wearing:

   a. Safety glasses
   b. Safety helmets
   c. Gloves

TASK 26: APPLYING ROLL ROOFING ON A HOUSE

COMMUNICATION

Δ 1. Reading directions on roll roofing for application of cement and nailing pattern.

MEASUREMENT

Δ 1. Measuring perimeter of area to be covered with a ruler to an accuracy of one foot.

MATHEMATICS

* 1. Multiplying in order to calculate area.

SKILLS

Δ 1. Nailing tin covering over holes (knots) with a hammer.

2. Rolling out roofing paper on ground to expose to sun before installation.

* 3. Laying out lines on roofing paper with a rule and framing square to an accuracy of one inch.

∅ 4. Cutting roofing paper to size with a roofing knife to an accuracy of one inch.

* 5. Cementing joints in roofing with brush and tar.

Δ 6. Nailing roofing paper in place with a hammer to an accuracy of 1/8 of an inch.

Δ 7. Removing bent nails with a bar or hammer.

8. Staggering the joints of the roofing.

INFORMATION

1. Explaining sq. ft./roll, sizes of roll (3' x 36') weight/roll.

2. Explaining recommended lap joint on end and edge of roofing.

3. Explaining differences in vertical and horizontal application of courses.

4. Explaining importance of driving nails straight.

5. Explaining importance of protecting roofing with proper foot wear.

Δ 6. Demonstrating safe use of a step ladder and extension ladder.

Δ 7. Protecting oneself by wearing gloves.

TASK 27: APPLYING SHEET METAL ROOFING TO A BUILDING

COMMUNICATION

* 1. Reading a blueprint to determine the side and end laps of roofing.

2. Reading a blueprint to determine type of nails to be used and their placement in the sheet.

MEASUREMENT

Δ 1. Measuring perimeter of area to be covered with a ruler to an accuracy of one foot.

MATHEMATICS

* 1. Multiplying in order to calculate area.

SKILLS

* 1. Squaring cuts with a framing square to an accuracy of 1/16 of an inch.
* 2. Cutting sheet metal to length and width with a hacksaw or tinsnips to an accuracy of 1/16 of an inch.
3. Lapping the joints on ends and sides.

Δ 4. Nailing sheets to sheathing with a hammer using lead-headed or galvanized nails and lead washer to an accuracy of 1/8 of an inch.

Δ 5. Removing bent nails with a bar or hammer.

INFORMATION

1. Explaining lap requirements for edges and ends of sheets.
2. Explaining the location of recommended nailing locations.

ø 3. Handling sheet metal with care in windy weather.

4. Keeping the roofing dry in the work area.
5. Keeping the work area on the roof clear of obstructions.
6. Wearing shoes which furnish maximum traction in the work area.

Δ 7. Demonstrating safe use of a step ladder and an extension ladder.

Δ 8. Protecting oneself by wearing:

   a. Safety glasses
   b. Safety shoes
   c. Gloves

TASK 28: APPLYING BUILT-UP ROOFING TO A BUILDING

COMMUNICATION

* 1. Reading a blueprint to determine the number of plies.

Δ 2. Reading manufacturer's instructions for installation of roofing material.

MEASUREMENT

Δ 1. Measuring perimeter of a roof with a tape or folding rule accurate to one foot.

MATHEMATICS

* 1. Calculating areas using addition, conversion to one unit, and multiplication.

SKILLS

∅ 1. Cutting roofing material with a knife to an accuracy of 1/8 of an inch.

Δ 2. Laying and nailing the sheathing paper with a hammer or staple hammer.

Δ 3. Removing bent nails with a bar or hammer.

4. Laying succeeding plies of felt and breaking the joints.

* 5. Mopping the felt with asphalt using a brush.

6. Covering last ply with roof slag, gravel or crushed stone with a shovel and rake.

* 7. Cleaning out brush after use with a solvent.

INFORMATION

1. Practicing safety precautions with hot asphalt.

Δ 2. Demonstrating safe use of a step ladder and an extension ladder.

Δ 3. Protecting oneself by wearing:

   a. Safety shoes
   b. Gloves

TASK 29: INSTALLING A HANGING GUTTER TO A ROOF

COMMUNICATION

* 1. Reading a blueprint to determine the direction of water flow and location of down spouts.

Δ 2. Reading manufacturer's instructions for installation of gutter and fittings.

MEASUREMENT

* 1. Measuring with a rule to locate hangers to an accuracy of 1/16 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to proper lengths.

SKILLS

Δ 1. Nailing hangers under shingles with a hammer accurate to 1/16 of an inch.

2. Raising a gutter into place with the aid of a ladder.

Δ 3. Nailing gutter into place with a hammer accurate to 1/16 of an inch.

Δ 4. Removing bent nails with a bar or hammer.

5. Fastening gutter with hooks.

* 6. Fastening downspout brackets to siding of a house with a screwdriver accurate to 1/8 of an inch.

7. Securing downspouts into brackets by hand.

INFORMATION

1. Demonstrating the placement of the gutter keeping it level.

* 2. Practicing safety precautions when using a screwdriver.

Δ 3. Demonstrating safe use of a step ladder and extension ladder.

Δ 4. Protecting oneself by wearing:

- a. Safety glasses
- b. Safety shoes
- c. Safety helmets
- d. Gloves

TASK 30: FASTENING WOOD TO MASONRY WITH TOGGLE BOLTS (LEAD SHIELDS, PLASTIC, WOOD PLUGS).

COMMUNICATION

Δ 1. Reading instructions to obtain proper hole size for fastener to be used.

* 2. Reading a blueprint to determine the location of the fastener.

MEASUREMENT

Δ 1. Measuring to find the location of the fastener within an accuracy of 1/16 of an inch.

* 2. Locating center points on a wall using two measurements.

SCIENCE

Δ 1. Explaining the importance of grounding electrical equipment.

SKILLS

* 1. Drilling holes for fasteners with an electric drill.

* 2. Drilling holes for fasteners with a star drill and hammer.

* 3. Driving fasteners with an impact tool.

* 4. Attaching wood to masonry with a screwdriver or wrench to an accuracy of 1/16 of an inch.

INFORMATION

* 1. Selecting the types of fasteners that best fit the requirements of the job.

* 2. Explaining the advantages and disadvantages of various available fasteners.

* 3. Using an adjustable wrench properly.

* 4. Explaining the method of installing each type of fastener.

* 5. Removing mushroomed head from a star drill with a grinder.

* 6. Using a screwdriver safely.

Δ 7. Using electric power tools safely.

Δ 8. Demonstrating safe use of a step ladder.

Δ 9. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 10. Protecting oneself by wearing:

a. Safety glasses
b. Gloves

TASK 31: INSTALLING INSULATION AND VAPOR BARRIORS (BLANKET, BULK, BATT, RIGID AND METALLIC) TO A HOUSE

COMMUNICATION

Δ 1. Reading instructions on package for proper installation of insulation.

MEASUREMENT

Δ 1. Measuring size of insulation needed with a ruler accurate to 1/8 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

SCIENCE

1. Describing heat as a form of energy, ways heat travels from one point to another, theory and principle of insulation.

SKILLS

ø 1. Cutting insulation to length with a saw, knife or shears to an accuracy of 1/8 of an inch.

2. Using a jig to cut a number of pieces of insulation to the same length.

Δ 3. Nailing rigid insulation to framing members with a hammer and flat head nails.

4. Pouring fill insulation between framing member by hand.

5. Blowing fill insulation between framing members by machine.

Δ 6. Nailing or stapling reflective insulation to framing members with a hammer, staple gun or hammer allowing 3/4 of inch minimum air space.

Δ 7. Placing flexible insulation in place by hand (held by friction) or nailing in place with a hammer and nailing flanges.

8. Sealing ends of blanket insulation with staples when installing.

INFORMATION

1. Recognizing the various types of insulation (rigid, fill, reflective, and flexible).

Δ 2. Demonstrating safe use of a step ladder.

Δ 3. Protecting oneself by wearing:

   a. Safety glasses
   b. Gloves

TASK 32: INSTALLING BACKING TO INTERIOR WALL

COMMUNICATION

* 1. Reading a blueprint to determine the location of fixtures, wall partitions, sheet rock, etc. for placement of backing blocks.

MEASUREMENT

Δ 1. Measuring for the placement of the backing with a folding rule or a tape to an accuracy of 1/16 of an inch.

SCIENCE

Δ 1. Explaining the importance of grounding electric tools.

SKILLS

* 1. Squaring backing blocks with a framing square to an accuracy of 1/16 of an inch.

* 2. Cutting backing to length with a crosscut hand saw, radial arm saw, or portable power saw to an accuracy of 1/16 of an inch.

Δ 3. Nailing or toe-nailing backing into place with a hammer to an accuracy of 1/16 of an inch.

Δ 4. Removing bent nails with a bar or hammer.

5. Drawing a sketch of final location of all backing blocks.

INFORMATION

Δ 1. Using electric power tools safely.

Δ 2. Demonstrating safe use of a step ladder.

Δ 3. Protecting oneself by wearing:

    a. Safety glasses
    b. Safety shoes
    c. Safety helmets

TASK 33: APPLYING COMMERCIAL WALL BOARD TO THE INTERIOR OF A BUILDING

COMMUNICATION

* 1. Reading a drawing to determine thickness of board, location for which it is prescribed and method of application.

MEASUREMENT

Δ 1. Measuring sheets to length and width with a rule to an accuracy of 1/16 of an inch.

* 2. Measuring for cutouts such as electrical outlets to an accuracy of 1/16 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

SCIENCE

Δ 1. Explaining the importance of grounding electric tools.

SKILLS

* 1. Squaring cuts with a framing square to an accuracy of 1/16 of an inch.

ø 2. Cutting wallboard to size with a sharp knife to an accuracy of 1/16 of an inch.

* 3. Cutting irregular cutouts with a keyhole saw or saber saw to an accuracy of 1/16 of an inch.

4. Installing wallboard with an adjustable lifter and/or lever-carrier.

* 5. Placing wallboard in position using a level and square to insure sheets will line up with framing members.

Δ 6. Nailing wallboard in place with a hammer, starting at center and working outward being careful not to break paper surface.

* 7. Locating framing members of a house by measuring or sounding.

Δ 8. Removing bent nails with a bar or hammer.

9. Applying adhesive for the second layer of wallboard with a serrated trowel.

Δ 10. Nailing board with a hammer to keep it in place while glue is drying.

11. Pressing board into place with wooden braces while glue is drying.

INFORMATION

1. Checking backing before placement of board.
2. Recognizing the various thicknesses of drywall material.
3. Placing beveled edge of sheet in most appropriate position.
4. Leaving room for expansion between sheets.
5. Placing nails at proper location from edge and proper distance apart.
6. Applying ceiling sheets first.

Δ 7. Demonstrating safe use of a step ladder.

Δ 8. Protecting oneself by wearing safety shoes.

TASK 34: INSTALLING FURRING AND GROUNDS TO INTERIOR OF A BUILDING

COMMUNICATION

* 1. Reading a blueprint or manufacturer's instructions to determine the center-to-center distance of furring or to determine location of the grounds.

MEASUREMENT

Δ 1. Laying out the location of furring and grounds with a folding rule or steel tape to an accuracy of 1/8 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

SCIENCE

Δ 1. Explaining the importance of grounding electric tools.

SKILLS

* 1. Sounding with a hammer to locate studs.

* 2. Squaring cuts with a framing square to an accuracy of 1/8 of an inch.

* 3. Cutting furring and grounds to length with a crosscut hand saw or power saw to an accuracy of 1/8 of an inch.

Δ 4. Nailing strips in place with a hammer to an accuracy of 1/8 of an inch.

Δ 5. Removing bent nails with a bar or hammer.

6. Marking stud locations on the floor with chalk for later identification.

INFORMATION

1. Identifying the proper thicknesses of grounds to be used.

Δ 2. Using electric power tools safely.

Δ 3. Demonstrating safe use of a step ladder.

Δ 4. Protecting oneself by wearing:

    a. Safety glasses
    b. Safety shoes
    c. Safety helmets

TASK 35: APPLYING LATH TO STUDDING

COMMUNICATION

* 1. Reading a blueprint to determine type and location of lath.

MEASUREMENT

Δ 1. Measuring short pieces of lath with a rule to an accuracy of 1/8 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

SCIENCE

Δ 1. Explaining the importance of grounding electric tools.

SKILLS

1. Constructing a scaffold using saw horses and planks.

* 2. Squaring cuts with a framing square to an accuracy of 1/8 of an inch.

ø 3. Cutting gypsum lath with an old saw or with a knife to an accuracy of 1/8 of an inch.

* 4. Cutting wood lath with a hand saw, power saw or hatchet to an accuracy of 1/8 of an inch.

* 5. Cutting metal lath with tin snips (hand or power) to an accuracy of 1/8 of an inch.

Δ 6. Nailing lath to studs with a hammer to an accuracy of 1/8 of an inch.

Δ 7. Removing bent nails with a bar or hammer.

Δ 8. Nailing on corner beads over lath with a hammer.

INFORMATION

1. Practicing safety precautions when using scaffolding.

2. Describing the 3-main types of lath (gypsum, wood, and metal).

Δ 3. Demonstrating safe use of a step ladder.

Δ 4. Using electric power tools safely.

Δ 5. Protecting oneself by wearing:

    a. Safety glasses
    b. Safety shoes
    c. Safety helmets

TASK 36: APPLYING CORNER BOARDS ON A HOUSE

COMMUNICATION

* 1. Reading a blueprint to determine the type of corner board.

SCIENCE

Δ 1. Explaining the importance of grounding electric tools.

SKILLS

1. Placing boards on corner to determine shape of top portion.

* 2. Cutting boards to shape and length with a cross cut hand saw or power saw to an accuracy of 1/16 of an inch.

Δ 3. Nailing both boards together with a hammer before placement to an accuracy of 1/32 of an inch.

* 4. Squaring cuts with a framing square to an accuracy of 1/16 of an inch.

* 5. Nailing corner boards to the siding or sheathing with a hammer to an accuracy of 1/16 of an inch.

Δ 6. Removing bent nails with a bar or hammer.

INFORMATION

Δ 1. Using electric power tools safely.

Δ 2. Demonstrating safe use of a step ladder and an extension ladder.

Δ 3. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 4. Protecting oneself by wearing:

  a. Safety glasses
  b. Safety shoes

TASK 37: ASSEMBLING BASEMENT STAIRS FOR A HOME

COMMUNICATION

* 1. Reading a blueprint to determine exact location of the stairs.

SKILLS

* 1. Attaching the sole plate to basement floor with an impact gun or concrete anchor to an accuracy of 1/16 of an inch.

Δ 2. Erecting the stringers into place with a hammer to an accuracy of 1/16 of an inch.

Δ 3. Nailing treads to stringers with a hammer to an accuracy of 1/16 of an inch.

Δ 4. Nailing risers (if used) to stringers with a hammer to an accuracy of 1/16 of an inch.

5. Assembling stairs on the floor and lifting into place.

INFORMATION

1. Using an impact tool safely.

Δ 2. Protecting oneself by wearing:

   a. Safety glasses
   b. Safety shoes
   c. Safety helmets

TASK 38: ERECTING ROOF AND DECK FRAMING FOR A PORCH

COMMUNICATION

* 1. Reading a blueprint to determine the type of construction and spacing of members.

MEASUREMENT

Δ 1. Locating the center of holes in plate with a tape, folding rule or framing square to an accuracy of 1/16 of an inch.

SCIENCE

Δ 1. Explaining the importance of grounding electric tools.

SKILLS

* 1. Drilling holes in plate by hand or with an electric drill.

* 2. Securing the plate to the masonery to an accuracy of 1/16 of an inch with a wrench.

* 3. Leveling sill and plate members with a level.

Δ 4. Nailing the frame together with a hammer and spike nails to an accuracy of 1/16 of an inch.

5. Erecting scaffolding to reach the roof members.

Δ 6. Erecting corner posts with a level and hammer to an accuracy of 1/16 of an inch.

Δ 7. Removing bent nails with a bar or hammer.

INFORMATION

1. Practicing safety precautions while erecting framing members from scaffolding and ladders.

2. Explaining reason for installing joists crown up.

* 3. Using an adjustable wrench properly.

Δ 4. Using electric power tools safely.

Δ 5. Demonstrating safe use of a step ladder and an extension ladder.

Δ 6. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 7. Protecting oneself by wearing:

    a. Safety glasses
    b. Safety shoes
    c. Safety helmets
    d. Gloves

TASK 39: LAYING PORCH FLOORS FOR A HOUSE

MEASUREMENT

Δ 1. Measuring the length of boards with a folding rule or steel tape to an accuracy of 1/16 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

SCIENCE

Δ 1. Explaining the importance of grounding electric tools.

SKILLS

* 1. Marking cuts with a framing square to an accuracy of 1/16 of an inch.

* 2. Cutting the flooring to length with a cross cut hand saw, portable power saw, or radial arm saw to an accuracy of 1/16 of an inch.

ø 3. Staggering the joints of the flooring strips for strength and appearance.

4. Driving flooring up tight with a hammer and scrap piece of flooring.

ø 5. Pulling flooring up tight with a prybar and scrap piece of flooring.

Δ 6. Nailing flooring to joists with a hammer to an accuracy of 1/16 of an inch.

7. Using a nail set to seat the nails.

Δ 8. Removing bent nails with a bar or hammer.

INFORMATION

ø 1. Recognizing the various thicknesses of flooring.

2. Recognizing the difference in top and bottom of board.

3. Explaining problems caused by hammer marks.

Δ 4. Using electric power tools safely.

Δ 5. Protecting oneself by wearing:

    a. Safety glasses
    b. Safety shoes

ELECTRICITY

TASK 1: INSTALLING BOXES FOR RECEPTACLES, SWITCHES, JUNCTIONS AND FIXTURES, IN A HOUSE

COMMUNICATION

* 1. Reading a blueprint to determine location of boxes.

Δ 2. Reading the "code" to determine regulations concerning placement and size of boxes.

MEASUREMENT

Δ 1. Measuring wall to locate boxes with a ruler to an accuracy of 1/16 of an inch.

SCIENCE

Δ 1. Explaining purpose of grounding portable electric tools.

SKILLS

Δ 1. Installing boxes with a hammer or screwdriver at proper location on framing members allowing for proper projection for various sheathing materials to an accuracy of 1/16 of an inch.

* 2. Squaring blocking with a framing square to an accuracy of 1/16 of an inch.

* 3. Cutting blocking to proper length with a hand saw or power saw in order to install boxes between framing members to an accuracy of 1/16 of an inch.

Δ 4. Installing blocking between joists with a hammer to an accuracy of 1/16 of an inch.

Δ 5. Removing bent nails with a bar or hammer.

* 6. Installing boxes between framing members with proper projection for various sheathing materials with a screwdriver to an accuracy of 1/16 of an inch.

* 7. Joining boxes together for multiple outlets, with a screwdriver.

8. Locating the center of a room with chalk line.

* 9. Installing boxes on a masonry wall with an electric drill and screwdriver to an accuracy of 1/8 of an inch.

* 10. Installing boxes on masonry with an impact tool.

ø 11. Removing knock out plugs only when necessary.

INFORMATION

ø 1. Explaining importance of the "code".

Δ 2. Explaining safe use of an electric saw and drill.

* 3. Explaining safe use of a screwdriver.

Δ 4. Explaining safe use of a step ladder.

* 5. Explaining methods of installing fasteners in masonry.

Δ 6. Explaining need for added care in electrical work when in contact with the ground.

Δ 7. Protecting oneself by wearing safety glasses.

TASK 2: INSTALLING WIRING FROM BOX TO BOX IN A HOUSE

COMMUNICATION

* 1. Reading a blueprint to determine size of wire required.

Δ 2. Reading "code" to determine size of wire required.

MEASUREMENT

Δ 1. Measuring length of running boards with a ruler to an accuracy of 1/8 of an inch.

SCIENCE

Δ 1. Explaining importance of grounding electric tools.

SKILLS

* 1. Cutting wire with side cutters.

* 2. Drilling holes in framing members with an electric drill for running wire.

2

* 3. Squaring running boards with a framing square to an accuracy of 1/8 of an inch.

* 4. Cutting running boards to size with a hand saw or power saw to an accuracy of 1/8 of an inch.

Δ 5. Installing running boards on framing members, with a hammer, for running wire.

Δ 6. Removing bent nails with a bar or hammer.

∅ 7. Running wire from box to box.

Δ 8. Fastening wire to framing members with staples and hammer.

∅ 9. Removing protective sheathing with a cable stripper.

∅ 10. Removing knock out plugs with a screwdriver.

∅ 11. Removing knock out plugs only when necessary.

* 12. Fastening wire to box with cable connectors and screwdriver.

∅ 13. Installing wire in conduit with a fish tape.

INFORMATION

∅ 1. Protecting cable insulation from damage by bending or kinking.

∅ 2. Explaining importance of "code".

Δ 3. Explaining safe use of an electric drill and saw.

Δ 4. Explaining safe use of a step ladder.

* 5. Explaining safe use of a screwdriver.

6. Running wire from box to box with no splices in between.

7. Protecting cable from nails used in construction.

Δ 8. Explaining need for added care in electrical work when in contact with the ground.

Δ 9. Protecting oneself by wearing:

    a. Safety glasses
    b. Safety helmets
    c. Gloves

TASK 3: CONNECTING RECEPTACLES, SINGLE THROW SWITCHES, FIXTURES AND PILOT LIGHTS TO COMPLETE CIRCUITS IN A HOUSE

COMMUNICATION

* 1. Reading a blueprint to determine location of switches, receptacles, fixtures and pilot lights.

Δ 2. Reading the "code" to determine acceptable practice for installation.

SCIENCE

* 1. Protecting L P soldering equipment from oil.

* 2. Explaining the need for fluxing action.

SKILLS

* 1. Cutting wire to length with side cutters.

ø 2. Removing inner insulation from wire with a knife.

* 3. Fastening wire under terminal screw with a screwdriver.

* 4. Fastening ground wire to receptacle, box or connector with a screwdriver.

* 5. Installing receptacles on switches in outlet boxes in a plumb or level position with a screwdriver.

* 6. Installing switch or receptacle plates with a screwdriver.

ø 7. Splicing wires with a pigtail splice using side cutters.

ø 8. Splicing wires with a wire nut.

* 9. Scraping wire with a knife prior to soldering.

* 10. Soldering a splice with a flame or electric soldering gun.

ø 11. Insulating a splice with electrical tape.

12. Hanging fixtures from a box with 1/8 inch pipe.

13. Connecting fixtures to a box by means of a strap.

INFORMATION

ø 1. Explaining importance of "code".

* 2. Explaining the safe use of a screwdriver.

Δ 3. Explaining safe use of a step ladder.

* 4. Cleaning up any dirt in area where work is finished.

* 5. Using various sorts of heat for soldering.

* 6. Using and storing L P soldering equipment with care.

* 7. Using safety precautions around hot materials.

Δ 8. Protecting oneself by wearing safety glasses.

TASK 4: ERECTING A TEMPORARY SERVICE POLE FOR PORTABLE ELECTRICAL EQUIPMENT USED IN BUILDING

COMMUNICATION

Δ 1. Reading "code" to determine proper installation.

MEASUREMENT

Δ 1. Measuring lumber with a ruler to an accuracy of 1/8 of an inch.

SKILLS

1. Digging a hole with a bar and shovel.

2. Erecting the service pole in the hole.

* 3. Filling the hole surrounding the pole with earth using a shovel.

* 4. Tamping the earth around the pole with a bar.

* 5. Cutting stakes with a hand saw.

* 6. Sharpening stakes with an axe.

* 7. Driving stakes with a sledge hammer.

Δ 8. Installing braces from stakes to pole with a hammer.

Δ 9. Fastening board to pole with a hammer for securing meter and fuse panel.

Δ 10. Removing bent nails with a bar or hammer.

Δ 11. Erecting waterproof covering for meter and fuse panel with a hammer and saw.

INFORMATION

Δ 1. Explaining safe use of a step ladder.

ϕ 2. Explaining importance of "code".

Δ 3. Protecting oneself by wearing:

a. Safety glasses
b. Safety shoes
c. Safety helmets
d. Gloves

TASK 5: INSTALLING RIGID AND THIN WALL CONDUIT FROM BOX TO BOX

COMMUNICATION

* 1. Reading a blueprint to determine the size of conduit required and location of outlet boxes.

* 2. Reading a table to determine size of conduit needed for number of wires to be run.

Δ 3. Reading "code" regarding installation of conduit.

MEASUREMENT

Δ 1. Measuring length of conduit with a ruler to an accuracy of 1/16 of an inch.

Δ 2. Measuring conduit diameter with a ruler to determine size.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing, in order to economically cut stock to correct lengths.

SCIENCE

Δ 1. Explaining importance of grounding electric tools.

SKILLS

* 1. Drilling holes for conduit in framing members with an electric drill.
* 2. Holding conduit in a vise.
* 3. Using cutting oil for cutting and threading conduit.
* 4. Cutting conduit to length with a cutter or hack saw to an accuracy of 1/16 of an inch.
* 5. Cutting conduit square for proper joints.
* 6. Reaming the conduit with a reamer.
* 7. Threading rigid conduit with a die, hand or machine.
* 8. Cutting pipe thread the proper length.
* 9. Changing die sizes of hand and power thread cutters.

10. Bending conduit with a hickey or improvised device.

* 11. Installing factory bent elbows with a wrench.
* 12. Installing pressure and threaded couplings with a wrench.
* 13. Installing conduit and fittings with a pipe wrench.

ø 14. Removing knock out plugs with a screwdriver.

ø 15. Removing knock out plugs only when necessary.

* 16. Connecting conduit to boxes with a wrench.
* 17. Leveling and plumbing exposed conduit with a level.
* 18. Installing straps on conduit with a screwdriver.

INFORMATION

1. Explaining importance of having a smooth interior in conduit.

ø 2. Explaining importance of "code".

Δ 3. Explaining safe use of electric drill.

* 4. Explaining safe use of screwdriver.

Δ 5. Explaining safe use of step ladder.

* 6. Cleaning cutting, reaming and threading tools with a cloth following use.

* 7. Using an adjustable wrench properly.

Δ 8. Explaining need for added care in electrical work when in contact with the ground.

Δ 9. Protecting oneself by wearing:

   a. Safety glasses
   b. Safety shoes
   c. Safety helmets
   d. Gloves

TASK 6: INSTALLING SEPARATE CIRCUIT FOR ELECTRIC RANGE

COMMUNICATION

* 1. Reading a blueprint to determine proper location of range outlet.

Δ 2. Reading code to determine acceptable procedure.

MEASUREMENT

Δ 1. Measuring wall to locate range outlet with a ruler accurate to 1/8 of an inch.

SCIENCE

Δ 1. Explaining the importance of grounding an electric drill.

SKILLS

* 1. Drilling holes with an electric drill for installation of cable.

* 2. Squaring running boards with a framing square to an accuracy of 1/8 of an inch.

* 3. Cutting running boards to size with a hand saw or power saw to an accuracy of 1/8 of an inch.

Δ 4. Installing running boards with a hammer for mounting of cable.

Δ 5. Removing bent nails with a bar or hammer.

∅ 6. Installing cable from fuse panel to outlet leaving sufficient amount for connections.

* 7. Cutting cable with a hack saw.

Δ 8. Fastening cable in place with a hammer or screwdriver.

∅ 9. Removing outer sheathing from cable with a knife.

∅ 10. Removing knock out plugs with a screwdriver.

∅ 11. Removing knock out plugs only when necessary.

* 12. Connecting cable to range outlet with a screwdriver.

∅ 13. Removing inner insulation from wire with a knife.

* 14. Connecting cable to terminals with a screwdriver.

* 15. Fastening range outlet in place with a screwdriver.

INFORMATION

Δ 1. Explaining safety precautions in using an electric drill and saw.

* 2. Explaining the safe use of a screwdriver.

∅ 3. Explaining importance of "code".

Δ 4. Explaining safe use of a step ladder.

∅ 5. Protecting cable from overbending which would damage insulation.

Δ 6. Explaining need for care in electrical work when in contact with the ground.

Δ 7. Protecting oneself by wearing safety glasses.

TASK 7: INSTALLING GROUNDS TO MEET CODE REQUIREMENTS FOR A HOUSE

COMMUNICATION

* 1. Reading a blueprint to determine location of ground.

Δ 2. Reading "code" to determine grounding requirements in rural and urban areas.

SCIENCE

1. Explaining the problem of electrolysis when two unlike metals touch each other.

SKILLS

* 1. Attaching ground clamp to cold water pipe at proper location with a screwdriver.

Δ 2. Attaching ground wire to framing members with a hammer and staples where required.

* 3. Connecting ground wire to the clamp with a screwdriver and running wire back to fuse panel.

* 4. Cutting wire to length with a hack saw.

* 5. Driving an "artificial ground" or "made electrode" with a sledge hammer for installation of a ground in rural areas.

INFORMATION

ø 1. Explaining the importance of "code".

2. Explaining the importance of using a ground clamp made of the proper material.

Δ 3. Demonstrating safe use of a step ladder.

* 4. Explaining safe use of screwdriver.

Δ 5. Protecting oneself by wearing:

   a. Safety glasses
   b. Gloves

TASK 8: INSTALLING ENTRANCE CABLE ON EXTERIOR OF A HOUSE

COMMUNICATION

* 1. Reading a blueprint to determine proper location.

Δ 2. Reading "code" to determine required procedure.

MEASUREMENT

Δ 1. Measuring wall for location of cable with a ruler to an accuracy of 1/8 of an inch.

SCIENCE

Δ 1. Explaining importance of grounding electric tools.

SKILLS

* 1. Locating framing members of house by observation or sounding.

* 2. Attaching service entrance head to house with a screwdriver.

ø 3. Removing outer sheathing from end of cable with a knife.

* 4. Installing entrance cable in entrance head with a screwdriver.

* 5. Plumbing and leveling the entrance cable where possible with a level.

* 6. Fastening cable to side of house with cable clamps, electric drill and screwdriver.

7. Bending cable carefully to make a neat installation.

* 8. Cutting cable with a hack saw.

INFORMATION

ø 1. Protecting cable from damage by overbending it.

Δ 2. Explaining safe use of an extension ladder.

ø 3. Explaining importance of "code".

Δ 4. Explaining safe use of electric drill.

5. Explaining importance of appearance of job.

* 6. Explaining safe use of screwdriver.

Δ 7. Protecting oneself by wearing safety glasses.

TASK 9: INSTALLING LOW VOLTAGE OPERATED BELLS

COMMUNICATION

* 1. Reading a blueprint to determine location of bells and buzzers.

2. Reading "code" to determine required procedure.

MEASUREMENT

Δ 1. Measuring wall for location of bells and buzzers with a ruler to an accuracy of 1/16 of an inch.

SCIENCE

Δ 1. Explaining purpose of grounding electric tools.

SKILLS

* 1. Cutting wire to length with side cutters.

* 2. Drilling holes for wire with an electric drill.

* 3. Squaring running boards with a framing square to an accuracy of 1/8 of an inch.

* 4. Cutting running boards to size with a hand saw or power saw to an accuracy of 1/8 of an inch.

Δ 5. Installing running boards with a hammer for mounting of wire.

Δ 6. Removing bent nails with a bar or hammer.

ϕ 7. Running wire from switch to bell and from switch to power source.

Δ 8. Fastening wire to framing members or running board with a hammer.

Ø 9. Removing insulation from wire with a knife.

* 10. Connecting wire to bell or buzzer and switch terminal with a screwdriver.

* 11. Installing bell or buzzer and switch in place with a screwdriver to an accuracy of 1/16 of an inch.

* 12. Installing housing on bell or buzzer with a screwdriver.

* 13. Connect transformer to signalling circuit with a screwdriver.

INFORMATION

Ø 1. Explaining purpose of "code".

* 2. Cleaning up after work in any area that has already been finished.

* 3. Explaining safe use of a screwdriver.

Δ 4. Explaining safe use of an electric drill and saw.

Δ 5. Explaining safe use of a step ladder.

Δ 6. Explaining need for added care in electrical work when in contact with the ground.

Δ 7. Protecting oneself by wearing safety glasses.

TASK 10: CONNECTING HOT WATER HEATER TO POWER SOURCE

COMMUNICATION

* 1. Reading manufacturer's directions for proper installation.

Δ 2. Reading "code" to determine acceptable method of installing a water heater.

* 3. Reading a blueprint to determine location of hot water heater.

MEASUREMENT

1. Measuring the wall with a ruler to an accuracy of 1/8 of an inch in order to locate a disconnect switch.

SCIENCE

Δ 1. Explaining purpose of grounding electric tools.

* 2. Protecting L P soldering equipment from oil.

* 3. Explaining the need for fluxing action.

SKILLS

* 1. Installing a disconnect switch with a screwdriver if the circuit is not protected by a circuit breaker.

* 2. Squaring running boards with a framing square to an accuracy of 1/8 of an inch.

* 3. Cutting running boards to size with a hand saw or power saw to an accuracy of 1/8 of an inch.

Δ 4. Installing running boards with a hammer for mounting of cable.

Δ 5. Removing bent nails with a bar or hammer.

* 6. Drilling holes with an electric drill for installation of cable.

ø 7. Installing wire from the switch to the water pump.

ø 8. Installing wire from the switch to the fuse panel.

Δ 9. Fastening cable in place with a hammer.

ø 10. Removing outer sheathing from cable with a cable stripper.

ø 11. Removing knock out plugs with a screwdriver.

ø 12. Removing knock out plugs only when necessary.

* 13. Installing cable in the boxes with connectors and a screwdriver.

* 14. Cutting cable to proper length with side cutters.

ø 15. Removing inner insulation from wires with a knife.

* 16. Connecting wires to terminals with a screwdriver .

* 17. Connecting ground wire to box or cable clamp with a screwdriver.

ø 18. Splicing wires with a pigtail splice using side cutters.

ø 19. Splicing wires with a wire nut.

* 20. Soldering a splice with a flame or soldering gun.

ø 21. Insulating splice with electricians tape.

ø 22. Installing fuses in the disconnect switch.

INFORMATION

ø 1. Explaining importance of the "code".

Δ 2. Explaining safety precautions in using an electric drill and saw.

* 3. Explaining safety in using the screwdriver.

Δ 4. Explaining need for added care in electrical work when in contact with the ground.

Δ 5. Explaining safety in using the step ladder.

ø 6. Protecting cable from damage from overbending.

* 7. Using various sorts of heat for soldering.

* 8. Using and storing L P soldering equipment with care.

* 9. Using safety precaution around hot materials.

Δ 10. Protecting oneself by wearing:

a. Safety glasses
b. Safety helmets

TASK 11: CONNECTING A WATER PUMP TO POWER SOURCE

COMMUNICATION

* 1. Reading a blueprint to determine the location of the pump.

Δ 2. Reading the "code" to determine required installation.

* 3. Reading manufacturer's directions for connecting water pump.

MEASUREMENT

Δ 1. Measuring the wall to locate a disconnect switch with a ruler accurate to 1/8 of an inch.

SCIENCE

Δ 1. Explaining purpose of grounding electrical tools.

* 2. Protecting L P soldering equipment from oil.

* 3. Explaining the need for fluxing action.

SKILLS

* 1. Installing a disconnect switch with a screwdriver if the circuit is not protected by a circuit breaker.

* 2. Drilling holes with an electric drill for installation of cable.

* 3. Squaring running boards with a framing square to an accuracy of 1/8 of an inch.

* 4. Cutting running boards to size with a hand saw or power saw to an accuracy of 1/8 of an inch.

Δ 5. Installing running boards with a hammer for mounting of cable.

Δ 6. Removing bent nails with a bar or hammer.

ø 7. Installing wire from switch to water pump.

ø 8. Installing wire from switch to fuse panel.

Δ 9. Fastening wire to framing members with staples and hammer.

ø 10. Removing outer sheathing from cable with a cable stripper.

ø 11. Removing knock out plugs with a screwdriver.

ø 12. Removing knock out plugs only when necessary.

* 13. Installing cable in the boxes with connectors and a screwdriver.

* 14. Cutting cable to proper length with side cutters.

ø 15. Removing inner insulation from wires with a knife.

* 16. Connecting wire to terminal with a screwdriver.

* 17. Connecting ground wire to box or cable clamp with a screwdriver.

ø 18. Splicing wires with a pigtail splice using side cutters.

ø 19. Splicing wires with a wire nut.

* 20. Soldering a splice with a flame or soldering gun.

ø 21. Insulating splice with electrical tape.

ø 22. Installing fuses in the disconnect switch.

INFORMATION

ø 1. Explaining importance of the "code".

ø 2. Protecting cable from damage caused by overbending.

Δ 3. Explaining safety precautions in using electric drill and saw.

* 4. Explaining safety in using the screwdriver.

Δ 5. Explaining safety in using the step ladder.

Δ 6. Explaining added care in electrical work when in contact with the ground.

* 7. Using various sorts of heat for soldering.

* 8. Using safety precautions around hot materials.

* 9. Using and storing L P soldering equipment with care.

Δ 10. Protecting oneself by wearing safety glasses.

TASK 12: INSTALLING ATTIC FAN OR ROOM COOLERS IN BUILDINGS

COMMUNICATION

* 1. Reading blueprints to determine proper location of fan.

Δ 2. Reading "code" to determine required installation.

* 3. Reading manufacturer's directions for installation.

MEASUREMENT

Δ 1. Measuring to locate an outlet box with a ruler to an accuracy of 1/16 of an inch.

SCIENCE

Δ 1. Explaining importance of grounding electrical tools.

* 2. Protecting L P soldering equipment from oil.

* 3. Explaining the need for fluxing action.

SKILLS

Δ 1. Installing switch box with hammer and screwdriver at proper location with extension from framing to allow for interior sheathing to an accuracy of 1/16 of an inch.

* 2. Drilling holes with an electric drill for installation of cable.

* 3. Squaring running boards with a framing square to an accuracy of 1/8 of an inch.

* 4. Cutting a running board to size with a hand saw or power saw to an accuracy of 1/8 of an inch.

Δ 5. Installing running boards with a hammer to an accuracy of 1/8 of an inch.

Δ 6. Removing bent nails with a bar or hammer.

ø 7. Installing cable from switch box to fan and from fuse box to switch box.

Δ 8. Fastening cable in place on framing members with a hammer.

Δ 9. Removing outer sheathing from cable with a cable stripper.

Δ 10. Removing knock out plugs with a screwdriver.

Δ 11. Removing knock out plugs only when necessary.

* 12. Installing cable in box with cable connectors and screwdriver.

* 13. Cutting wire to length with side cutters.

ø 14. Removing inner insulation from wire with a knife.

* 15. Connecting wires to terminal with a screwdriver.
* 16. Connecting ground wire to the box or cable connector with a screwdriver.
ø 17. Splicing wires with a pigtail splice using side cutters.
* 18. Soldering a splice with a flame or a soldering gun.
ø 19. Splicing wires with a wire nut.
ø 20. Insulating splice with electrical tape.

INFORMATION

ø 1. Explaining the importance of the "code".
Δ 2. Explaining safety in using the electric drill and saw.
* 3. Explaining safety in using the screwdriver.
Δ 4. Explaining safety in using a step ladder.
ø 5. Protecting cable from damage from overbending.
* 6. Cleaning up the work area upon completion of job.
* 7. Using various sorts of heat for soldering.
* 8. Using and storing L P soldering equipment with care.
* 9. Using safety precautions around hot materials.
Δ 10. Protecting oneself by wearing safety glasses.

TASK 1: SETTING UP WORK AREA IN ORDER TO EXPEDITE THE MIXING OF CONCRETE ON THE JOB

MEASUREMENT

Δ 1. Measuring lumber with a rule to an accuracy of 1/8 of an inch.

SCIENCE

Δ 1. Explaining importance of grounding electric power tools.

SKILLS

* 1. Positioning supplies for ease in shoveling into mixer.

* 2. Leveling mixer and water barrel with a level.

* 3. Squaring lumber with a framing square to an accuracy of 1/4 of an inch.

* 4. Cutting lumber with a hand saw or power saw to an accuracy of 1/4 of an inch.

Δ 5. Constructing a container with a hammer for cement so it does not have to be shoveled from the bag.

Δ 6. Removing bent nails with a bar or hammer.

7. Protecting lead cord from water near the mixer.

8. Checking mixer for proper oil level.

9. Providing gasoline and lubricant for mixer.

INFORMATION

1. Explaining advantage of using separate shovel for cement.

Δ 2. Using electric power tools safely.

Δ 3. Protecting oneself by wearing:

    a. Safety shoes
    b. Gloves

TASK 2: CLEANING AND OILING CONCRETE FORMS PRIOR TO USE

SKILLS

Δ 1. Removing all nails used in assembling forms with a hammer or bar.

2. Hammering forms with a rubber mallet to loosen cement.

3. Scraping forms with a hoe to remove cement.

* 4. Brushing loose cement off forms with a wire brush.

5. Applying oil to surfaces in contact with a brush.

INFORMATION

1. Protecting form surface from damage.

2. Lifting heavy material safely.

Δ 3. Protecting oneself by wearing:

    a. Safety glasses
    b. Safety shoes
    c. Gloves

TASK 3: PREPARING A BATCH OF CEMENT, PLASTER, LIME MORTAR AND CEMENT-LIME MORTAR BY HAND AND BY MACHINE

COMMUNICATION

* 1. Receiving and interpreting vocal instructions of mason or plasterer.

* 2. Reading a blueprint to determine mix proportions.

MATHEMATICS

* 1. Halving, doubling, tripling, etc., proportions to suit the size of mix needed.

Δ 2. Explaining importance of grounding electric power tools.

SKILLS

* 1. Measuring proper amount of ingredients with a shovel.

* 2. Inserting ingredients into mixer or mortar box in proper order with a shovel.

* 3. Mixing ingredients dry with hoe or machine.

4. Adding proper amount of water to mix with a pail.

5. Performing a slump test to meet specifications of job.

* 6. Cleaning up mixer following use with stone, water and wire brush.

* 7. Cleaning up tools following use with water and brush.

INFORMATION

1. Explaining need to adjust amount of water when sand and stone are wet.

2. Explaining necessity of measuring ingredients accurately.

Δ 3. Explaining safety measures when using power equipment.

4. Explaining advantage of keeping cement shovel dry.

Δ 5. Protecting oneself by wearing:

   a. Safety glasses
   b. Safety shoes
   c. Safety helmets
   d. Gloves

Δ 6. Explaining added precautions when using electric tools if operator is in contact with the ground.

TASK 4: SHORING EMBANKMENTS AND SIDEWALLS OF EARTHEN DITCHES TO PREVENT CAVE-INS DURING AND FOLLOWING EXCAVATION

MEASUREMENT

Δ 1. Measuring lumber with a rule to an accuracy of 1/8 of an inch.

MATHEMATICS

* 1. Adding, subtracting, dividing, multiplying in order to economically cut stock to correct lengths.

SCIENCE

Δ 1. Explaining the importance of grounding electric power tools.

SKILLS

* 1. Squaring cuts with a framing square to an accuracy of 1/8 of an inch.

* 2. Cutting lumber to required length with hand saw or power saw within an accuracy of 1/8 of an inch.

* 3. Sharpening lumber to be used for stakes with an axe or power saw.

* 4. Driving stakes with a sledge hammer.

Δ 5. Nailing structure securely with a hammer.

Δ 6. Removing bent nails with a bar or hammer.

INFORMATION

1. Explaining safety precautions for the worker near unstable earth.

* 2. Demonstrating methods of bracing to provide security.

Δ 3. Using electric power tools safely.

Δ 4. Demonstrating safe use of a step ladder and an extension ladder.

Δ 5. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 6. Protecting oneself by wearing:

a. Safety glasses
b. Safety shoes
c. Safety helmets
d. Gloves

TASK 5: INSTALLING RODS AND SPREADERS TO SPACE FORM SECTIONS

COMMUNICATION

* 1. Reading a blueprint to determine spacing of rods and spreaders.

MEASUREMENT

Δ 1. Measuring lumber with a rule to an accuracy of 1/16 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

SCIENCE

Ø 1. Explaining pressure developed by concrete when poured in place.

Δ 2. Explaining importance of grounding electric tools.

SKILLS

* 1. Marking end spreaders with a framing square or sliding T-bevel to an accuracy of 1/16 of an inch.

* 2. Cutting spreaders to proper length with a hand or power saw to an accuracy of 1/16 of an inch.

Δ 3. Nailing spreaders for security, but easy removal, with a hammer.

* 4. Tightening rods through forms to an even tension with a wrench.

* 5. Drilling holes in forms with a hand or power drill.

Δ 6. Removing bent nails with a bar or hammer.

INFORMATION

* 1. Demonstrating proper use of adjustable wrenches.

Δ 2. Demonstrating safe use of a step ladder.

Δ 3. Using electric power tools safely.

Δ 4. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 5. Protecting oneself by wearing:

a. Safety glasses
b. Safety shoes
c. Safety helmets
d. Gloves

TASK 6: WIRING AND BOLTING FORMS TO PREVENT SPREADING

COMMUNICATION

* 1. Reading a blueprint to determine spacing of wiring and bolts.

MEASUREMENT

Δ 1. Measuring wire with a rule to proper length.

SCIENCE

ϕ 1. Explaining pressure developed by concrete when poured in place.

Δ 2. Explaining need for grounding an electric drill.

SKILLS

* 1. Cutting wire to proper length with side cutting pliers.

* 2. Drilling holes for wire and bolts by hand and with an electric drill.

3. Inserting wire in the form.

4. Twisting wire in form to proper tension.

* 5. Tightening bolts to an even tension with a wrench.

INFORMATION

* 1. Demonstrating proper use of adjustable wrenches.

Δ 2. Using electric power tools safely.

Δ 3. Demonstrating safe use of a step ladder.

Δ 4. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 5. Protecting oneself by wearing:

  a. Safety glasses
  b. Safety shoes
  c. Safety helmets
  d. Gloves

TASK 7: BRACING SIDEWALLS OF FORMS TO PREVENT SPREADING

COMMUNICATION

* 1. Reading a blueprint to determine bracing specified for the job.

MEASUREMENT

Δ 1. Measuring lumber with a rule to an accuracy of 1/16 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct length.

SCIENCE

ø 1. Explaining pressure developed by concrete when first poured in place.

Δ 2. Explaining importance of grounding electric power tools.

SKILLS

* 1. Squaring cuts with a framing square to an accuracy of 1/16 of an inch.

* 2. Cutting square and angle braces with a hand saw or power saw to an accuracy of 1/16 of an inch.

Δ 3. Nailing braces securely with a hammer.

Δ 4. Removing bent nails with a bar or hammer.

* 5. Sharpening stakes with saw or axe.

* 6. Driving stakes with a sledge hammer.

INFORMATION

Δ 1. Explaining safety precautions for using power saws.

2. Explaining danger of cave in with unstable earth.

* 3. Demonstrating types of effective bracing.

Δ 4. Demonstrating safe use of a step ladder.

Δ 5. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 6. Protecting oneself by wearing:

  a. Safety glasses
  b. Safety shoes
  c. Safety helmets
  d. Gloves

TASK 8: INSTALLING ANCHOR BOLTS IN MASONRY WALLS AND CONCRETE TO PROVIDE A PLACE FOR SECURING FUTURE CONSTRUCTION

COMMUNICATION

* 1. Reading a blueprint to determine location of bolts and length of exposure desired.

MEASUREMENT

Δ 1. Measuring wall or slag with a rule to find location of bolts within an accuracy of 1/8 of an inch.

SKILLS

1. Blocking off cells in concrete block walls with paper at a depth so head of bolt will be surrounded by cement.

2. Filling cavity with stiff cement.

3. Placing the bolt in cement allowing for proper exposure.

4. Puddling cement around bolt head with a small trowel to insure that it will not turn when cement is hard.

5. Checking bolt for plumb and proper exposure with a square and rule.

6. Protecting bolts from accidental movement while drying.

INFORMATION

1. Explaining importance of not leaving an air cavity around bolt head.

Δ 2. Demonstrating safe use of a step ladder and extension ladder.

Δ 3. Protecting oneself by wearing gloves.

TASK 9: PROTECTING A CONCRETE SLAB FOLLOWING FINISHING OPERATIONS TO PROVIDE FOR PROPER CURING

COMMUNICATION

* 1. Reading a blueprint to determine recommended protection for curing.

MEASUREMENT

Δ 1. Measuring lumber with a rule to an accuracy of 1/4 of an inch.

SCIENCE

Δ 1. Explaining importance of grounding electric power tools.

SKILLS

1. Covering concrete with straw, canvas, polyethylene to slow down drying or to provide protection from freezing.

2. Checking temperature of concrete with a thermometer to determine if it is safe from freezing.

* 3. Squaring lumber with a framing square to an accuracy of 1/8 of an inch.

* 4. Cutting lumber with a hand saw or power saw to an accuracy of 1/8 of an inch.

Δ 5. Constructing sun shades and wind breaks with a hammer to prevent rapid drying.

Δ 6. Removing bent nails with a bar or hammer.

* 7. Starting and shutting off fuel burning heaters such as salamanders.

8. Sprinkling concrete with water with a hose to reduce evaporation of water from concrete.

INFORMATION

1. Explaining need for temperature and humidity control.

* 2. Protecting oneself and premises when handling fuel and fuel burning heaters.

* 3. Explaining venting necessary for safety when using fuel burning heaters in an enclosed space.

Δ 4. Using electric power tools safely.

Δ 5. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 6. Protecting oneself by wearing:

  a. Safety glasses
  b. Safety shoes
  c. Gloves

TASK 10: ERECTING SCAFFOLD FOR USE BY A MASON

COMMUNICATION

* 1. Reading a blueprint to determine type of scaffolding specified.

MEASUREMENT

Δ 1. Measuring lumber with a rule to an accuracy of 1/4 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

SCIENCE

Δ 1. Explaining importance of grounding electric power tools.

SKILLS

1. Erecting low scaffold with concrete block and plank.

* 2. Squaring lumber to be cut with a framing square to an accuracy of 1/4 of an inch.

* 3. Cutting lumber with hand and power saws to an accuracy of 1/4 of an inch.

Δ 4. Nailing lumber for scaffolding securely with a hammer to an accuracy of 1/8 of an inch.

* 5. Bracing scaffolding securely with cross members.

* 6. Sharpening stakes with a saw or axe.

* 7. Driving stakes with a sledge hammer.

* 8. Bracing scaffolding from stakes.

* 9. Protecting bottom of scaffold pole from sinking into the ground with a flat stone or board.

* 10. Leveling members with a level and straight edge to hold walkway.

Δ 11. Removing bent nails with a bar or hammer.

INFORMATION

Δ 1. Explaining safe practices in using power saws.

* 2. Understanding that scaffold must support worker and materials.

* 3. Checking lumber for defects (knots) prior to using.

4. Explaining method of attaching a scaffold to a building.

Δ 5. Demonstrating safe use of a step ladder and an extension ladder.

Δ 6. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 7. Protecting oneself by wearing:

   a. Safety glasses
   b. Safety shoes
   c. Safety helmets
   d. Gloves

TASK 11: CLEANING OUT MORTAR JOINTS FOR TUCK-POINTING

SKILLS

* 1. Removing cement of mortar with hammer and chisel to a depth of one inch.

2. Removing cement or mortar with a pneumatic chisel to a depth of one inch.

3. Cleaning out chips and dust with water or air.

INFORMATION

* 1. Using a dust mask when cleaning out mortar joints.

2. Explaining safety precautions necessary when using a pneumatic chisel.

3. Removing all loose mortar, even beyond a depth of one inch when required.

Δ 4. Demonstrating safe use of a step ladder and an extension ladder.

* 5. Removing mushroomed heads from a cold chisel with a grinder.

Δ 6. Protecting oneself by wearing:

   a. Safety glasses
   b. Safety shoes
   c. Safety helmets
   d. Gloves

TASK 12: POINTING UP A SECTION OF BRICK WALL TO PROVIDE FINISHED APPEARANCE

COMMUNICATION

* 1. Reading a blueprint to determine type of pointing required.

SKILLS

1. Finishing a wall with a concave or V-shaped joint using a joiner.
2. Finishing a wall with a weathered joint using a trowel.
3. Finishing a wall with a rough cut or flush joint using a trowel.
4. Finishing a wall with a struck joint using a trowel.
5. Finishing a wall with a raked joint using a joint raker.

* 6. Cleaning tools following use with water and a steel brush.

INFORMATION

1. Knowing advantages and disadvantages of the various pointing-up techniques.

Δ 2. Demonstrating safe use of a step ladder and extension ladder.

Δ 3. Protecting oneself by wearing gloves.

TASK 13: APPLYING COLORLESS COATING TO WATERPROOF MASONRY SURFACES ABOVE GRADE ON A BUILDING

COMMUNICATION

* 1. Reading manufacturer's instructions for application.

MEASUREMENT

Δ 1. Measuring perimeter of area to be coated with a ruler accurate to nearest foot.

* 2. Dividing the gallon into quarts and pints to determine quantity required for area to be covered.

MATHEMATICS

* 1. Multiplying to compute area to be covered.

* 2. Dividing in order to find volume necessary for area to be covered.

SKILLS

1. Cleaning area to be covered with stiff broom.

* 2. Opening a can of material with a paint can opener.

* 3. Applying coating with a brush.

* 4. Cleaning rim of container free of finishing material.

* 5. Resealing can of coating material with a hammer.

* 6. Cleaning applicator.

7. Protecting coated area from traffic until dry.

INFORMATION

Δ 1. Demonstrating safe use of a step ladder and an extension ladder.

Δ 2. Protecting oneself by wearing:

a. Safety glasses
b. Gloves

TASK 14: APPLYING ASPHALT COATING TO WATERPROOF FOUNDATION WALLS BELOW GRADE

COMMUNICATION

* 1. Reading manufacturer's instructions for application.

* 2. Reading blueprint to determine height of application and number of coats required.

MEASUREMENT

Δ 1. Measuring height of asphalt coating with a ruler accurate to the nearest inch.

SCIENCE

1. Protecting combustable material when heating it.

SKILLS

* 1. Cleaning the area to be coated with a chisel and hammer, hoe and stiff broom.

2. Opening the can of asphalt coating with a hammer or small pry bar.

3. Heating asphalt coating prior to use in cold weather.

* 4. Applying asphalt coating with a brush being sure to cover joint between wall and footing.

* 5. Cleaning and storing applicator.

* 6. Resealing can of asphalt coating with a hammer.

INFORMATION

1. Planning work schedule in order to work in the sun.

2. Applying asphalt coating in an orderly manner to insure personal cleanliness.

3. Examining cement surface to be sure the pores of cement are sealed.

* 4. Removing mushroomed heads from a cold chisel with a grinder.

Δ 5. Protecting oneself by wearing:

   a. Safety glasses
   b. Safety helmets
   c. Gloves

TASK 15: POURING A SECTION OF FOOTING CONTAINING REINFORCING ROD

SCIENCE

Ø 1. Explaining the pressure developed by concrete when poured in place.

Δ 2. Explaining importance of grounding electric power tools.

SKILLS

Ø 1. Removing any debris from the cavity to be poured.

Ø 2. Checking form to be sure it is secure and clean.

Ø 3. Wetting the forms and surrounding earth.

Ø 4. Placing concrete in form where needed.

Ø 5. Puddling or vibrating the concrete with a hoe or mechanical vibrator.

Ø 6. Leveling the top of the concrete with a screed.

Ø 7. Checking the top of the concrete for low spots.

* 8. Cleaning tools with water and wire brush.

INFORMATION

Ø 1. Explaining purpose of vibrating the concrete mix.

Ø 2. Explaining why concrete should be "placed" rather than pushed or pulled from one place to another.

Ø 3. Explaining why concrete should not be overworked when plastic.

Δ 4. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 5. Protecting oneself by wearing:

a. Safety shoes
b. Safety helmets
c. Gloves

TASK 16: POURING A SMALL REINFORCED CONCRETE SLAB SUITABLE FOR A PORCH DECK

SCIENCE

ø 1. Explaining the pressure developed by concrete when poured in place.

Δ 2. Explaining importance of grounding electric power tools.

SKILLS

ø 1. Removing any debris from the cavity to be poured.

ø 2. Checking form to make sure it is clean and secure.

ø 3. Wetting the form and any surrounding earth.

ø 4. Placing concrete in form where needed.

5. Pulling reinforcing mesh up into the concrete.

ø 6. Puddling or vibrating the concrete with a hoe or mechanical vibrator.

ø 7. Leveling the top of the concrete with a screed.

ø 8. Checking the surfaces of the slab for low spots.

* 9. Cleaning tools with water and wire brush following use.

INFORMATION

ø 1. Explaining purpose of vibrating the concrete mix.

ø 2. Explaining why concrete should be "placed" rather than pushed or pulled from one place to another.

ø 3. Explaining why concrete should not be overworked when plastic.

Δ 4. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 5. Protecting oneself by wearing:

a. Safety helmets
b. Gloves

TASK 17: INSTALLING FOOTER FORMS TO RECEIVE CONCRETE

COMMUNICATION

* 1. Reading a blueprint to determine types and location.

MEASUREMENT

Δ 1. Measuring length of material with a ruler to an accuracy of 1/8 of an inch.

SCIENCE

ϕ 1. Explaining pressure developed by concrete when poured in place.

Δ 2. Explaining importance of grounding electric tools.

SKILLS

* 1. Squaring cuts with a framing square to an accuracy of 1/8 of an inch.

* 2. Cutting material to size with a hand saw or power saw to an accuracy of 1/8 of an inch.

* 3. Sharpening stakes with an axe or power saw.

* 4. Driving stakes with a sledge hammer.

* 5. Leveling forms with a level.

Δ 6. Nailing forms in place with a hammer to an accuracy of 1/16 of an inch.

Δ 7. Removing bent nails with a bar or hammer.

* 8. Bracing forms with lumber or earth.

INFORMATION

Δ 1. Using electric power tools safely.

Δ 2. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 3. Protecting oneself by wearing:

- a. Safety glasses
- b. Safety shoes
- c. Safety helmets
- d. Gloves

TASK 18: SETTING A SECTION OF SIDEWALK FORM TO RECEIVE CONCRETE

COMMUNICATION

* 1. Reading a blueprint to determine recommended method of installing forms.

MEASUREMENT

Δ 1. Measuring diagonals within 1/8 of an inch to square the form.

SCIENCE

Δ 1. Explaining need for grounding electric power tools.

ϕ 2. Explaining pressure developed by concrete when poured in place.

SKILLS

* 1. Sawing stakes to length by hand or with power saw.

* 2. Sharpening stakes with an axe or power saw.

* 3. Driving stakes with a sledge hammer.

* 4. Squaring a form by measuring the diagonals or by using a framing square.

* 5. Leveling a form with a level.

Δ 6. Nailing the form to stakes with a hammer to prevent movement to an accuracy of 1/16 of an inch.

* 7. Checking form for level and square with a rule and level.

* 8. Bracing a form with lumber or earth to prevent spreading.

* 9. Cutting all stakes and braces level with the top of the form with a hand saw.

Δ 10. Removing bent nails with a bar or hammer.

INFORMATION

1. Explaining importance of keeping top edge of form clear of obstruction.

Δ 2. Using electric power tools safely.

Δ 3. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 4. Protecting oneself by wearing:

a. Safety glasses
b. Safety shoes
c. Gloves

TASK 19: FINISHING A SMALL CONCRETE SLAB TO PROVIDE UTILITY AND PLEASING APPEARANCE

COMMUNICATION

* 1. Reading a blueprint to determine finish specified.

SKILLS

1. Leveling the slab immediately after screeding with a bull float or darby.

2. Edging the slab after surface water disappears with an edger.

3. Floating the surface of the slab with a float.

4. Troweling the surface with a steel trowel.

5. Finishing a slab with a broom finish.

* 6. Cleaning up tools following use with a steet brush and water.

INFORMATION

1. Explaining why concrete should not be overworked when plastic.

Δ 2. Protecting oneself by wearing gloves.

TASK 20: LAYING CEMENT BLOCK FOR A WALL IN STRETCHER COURSES

COMMUNICATION

* 1. Reading a blueprint to determine location, length, height and thickness of wall.

MEASUREMENT

Δ 1. Measuring height of course, location of wall and height of wall with a rule or tape to an accuracy of 1/16 of an inch.

MATHEMATICS

* 1. Dividing to find the number of blocks in one course.

SKILLS

Δ 1. Setting up a line with hammer and nails or corner block.

* 2. Cutting cement block with a hammer and chisel.

3. Laying a bed of mortar for the block with a trowel.

4. Throwing mortar on the end of a block with a trowel.

5. Laying block in the wall.

6. Leveling block to line with trowel handle or mallet.

* 7. Plumbing block face to previous course with trowel handle or mallet using the eye or level as a guide.

8. Cleaning off excess mortar with a trowel.

* 9. Cleaning tools following use with water and steel brush.

INFORMATION

* * 1. Removing mushroomed heads from a cold chisel with a grinder.
* 2. Explaining how to determine when mortar is too wet or too dry.
* 3. Explaining why it is necessary to avoid over hammering the block to get it into position.
* 4. Explaining why it is necessary to "keep off" the line.
* Δ 5. Demonstrating safe use of a step ladder.
* Δ 6. Protecting oneself by wearing:
    - a. Safety glasses
    - b. Safety shoes
    - c. Safety helmets
    - d. Gloves

TASK 21: LAYING UP THE FOLLOWING BONDS WITHOUT MORTAR TO ILLUSTRATE A BASIC KNOWLEDGE OF EACH (RUNNING, COMMON, FLEMISH, ENGLISH, BASKET WEAVE)

COMMUNICATION

* * 1. Reading a blueprint to determine the type of bond specified.
* Δ 2. Interpreting bond layout diagrams in order to layout bond correctly.

SKILLS

1. Layout a running bond of four courses without mortar.
2. Layout flemish bond for an 8 inch wall of 4 courses without mortar.
3. Layout a common bond for an 8 inch wall of 7 courses without mortar.
4. Layout English bond for an 8 inch wall of 4 courses without mortar.
5. Layout a basket weave in a panel for an 8 inch wall of 6 courses without mortar.

* 6. Cutting brick with a hammer and cold chisel.

INFORMATION

* 1. Removing mushroomed heads from a cold chisel with a grinder.

Δ 2. Protecting oneself by wearing:

- a. Safety glasses
- b. Safety shoes
- c. Safety helmets
- d. Gloves

PAINTING

TASK 1: PREPARING A SURFACE FOR APPLICATION OF STAIN

SCIENCE

Δ 1. Explaining the importance of grounding electric power tools.

SKILLS

Δ 1. Setting nails with a hammer and nail set.

* 2. Removing hardware with a screwdriver prior to finishing.

∅ 3. Sanding the surface by hand or machine to desired quality.

∅ 4. Raising the grain of wood with water.

∅ 5. Removing grease and oil stains with solvent and/or heat.

∅ 6. Applying wood filler to defects or to open grained wood.

∅ 7. Cleaning the surface of sanding dust with a cloth, vacuum cleaner or tack rag.

INFORMATION

∅ 1. Explaining grades of sandpaper available.

∅ 2. Explaining how to check wood to see if it is ready for stain.

∅ 3. Explaining types of sanders available.

* 4. Using a dust mask when sanding.

∅ 5. Explaining types of filler available.

* 6. Using a screwdriver safely.

∅ 7. Using various types of power sanders correctly.

Δ 8. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 9. Demonstrating safe use of a step ladder and an extension ladder.

* 10. Cleaning up the work area upon completion of the job.

Δ 11. Protecting oneself by wearing safety glasses.

TASK 2: PREPARING A SURFACE FOR APPLICATION OF PAINT IN OR ON A HOUSE

COMMUNICATION

Δ 1. Reading instructions on paint container pertaining to preparation of surface.

SCIENCE

1. Explaining how to handle chemicals safely.

Δ 2. Explaining the importance of grounding electric power tools.

SKILLS

* 1. Removing loose paint with a wire brush.

Δ 2. Setting nails with a hammer.

* 3. Removing hardware with a screwdriver prior to finishing.

4. Removing old finishes by heat or chemical means.

ø 5. Sanding a surface with a power sander or by hand to desired quality.

ø 6. Applying filler to level defects in the surface with a putty knife.

7. Applying a cleaning solvent to galvanized iron prior to painting with a brush.

8. Removing loose paint with a scraper.

9. Removing grease, oil and wax with commercial cleaners.

10. Applying an etching solution to concrete with a brush.

11. Applying a sealer with a brush to knots and materials which will "bleed".

12. Applying preservative with a brush to wood in contact with moisture.

INFORMATION

ø 1. Explaining types and grades of sandpaper available.

ϕ 2. Explaining types of sanding machines available.

ϕ 3. Explaining types of paint remover available.

ϕ 4. Explaining types of filler available.

5. Explaining types of sealers available for plaster, dry wall, new wood, knots.

* 6. Using a dust mask when sanding.

ϕ 7. Explaining clothing appropriate to use when working with chemicals.

ϕ 8. Explaining recommended primers for various surfaces.

* 9. Using a screwdriver safely.

* 10. Providing proper ventilation in the work area.

ϕ 11. Selecting solvents for various finishing materials.

Δ 12. Demonstrating safe use of a step ladder and an extension ladder.

* 13. Cleaning up the work area upon completion of the job.

Δ 14. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 15. Protecting oneself by wearing:
    a. Safety glasses
    b. Gloves

TASK 3: PREPARING A SURFACE FOR APPLICATION OF A CLEAR FINISH

SCIENCE

Δ 1. Explaining the importance of grounding electric power tools.

SKILLS

Δ 1. Setting nails with a hammer and nail set.

* 2. Removing hardware with a screwdriver prior to finishing.

ϕ 3. Sanding the surface by hand or machine to desired quality.

∅ 4. Raising the grain of wood with water.

∅ 5. Removing grease and oil stains with solvent and/or heat.

∅ 6. Applying wood filler to defects or to open grained wood.

∅ 7. Cleaning the surface of sanding dust with a cloth, vacuum cleaner or tack rag.

INFORMATION

∅ 1. Explaining grades of sandpaper available.

2. Inspecting surface to determine readiness for clear finish.

∅ 3. Explaining types of sanders available.

* 4. Using a dust mask when sanding.

∅ 5. Explaining types of filler available.

* 6. Using a screwdriver safely.

∅ 7. Using various types of power sanders correctly.

8. Selecting a dust free location for applying finish.

Δ 9. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 10. Demonstrating safe use of a step ladder and an extension ladder.

* 11. Cleaning up the work area upon completion of the job.

Δ 12. Protecting oneself by wearing safety glasses.

TASK 4: REMOVING OLD FINISHES IN PREPARATION FOR RESURFACING

COMMUNICATION

Δ 1. Reading instructions for use of paint and varnish remover.

MEASUREMENT

Δ 1. Measuring length and width with a rule accurate to the nearest foot.

MATHEMATICS

* 1. Multiplying to find the area of a surface.

* 2. Dividing to find the quantity of paint and varnish remover required.

SCIENCE

Δ 1. Explaining importance of grounding electric power tools.

SKILLS

Δ 1. Setting nails with a hammer and nail set.

* 2. Removing hardware with a screwdriver.

* 3. Applying paint and varnish remover with a brush.

4. Removing paint and varnish remover with a scraper or putty knife.

5. Removing paint and varnish remover with coarse steel wool on irregular surfaces.

6. Applying a solution to neutralize the paint and varnish remover if called for by manufacturer's instructions.

∅ 7. Sanding the surface by hand or machine to remove old finish.

INFORMATION

* 1. Protecting owner's property with drop cloths when using paint and varnish remover.

∅ 2. Protecting oneself from paint and varnish remover that is irritable to the skin.

∅ 3. Explaining types of paint remover available.

* 4. Using a dust mask when sanding.

* 5. Using a screwdriver safely.

* 6. Providing proper ventilation in the work area.

∅ 7. Explaining grades of sandpaper available.

∅ 8. Explaining types of sanders available.

ø 9. Using various types of power sanders correctly.

Δ 10. Explaining added precautions when using electric tools if operator is in contact with the ground.

* 11. Cleaning up the work area upon completion of the job.

Δ 12. Demonstrating safe use of a step ladder and an extension ladder.

Δ 13. Protecting oneself by wearing:

    a. Safety glasses
    b. Gloves

TASK 5: PREPARING STAIN AND APPLICATOR FOR USE

COMMUNICATION

Δ 1. Reading directions on container for application.

SCIENCE

Δ 1. Explaining the importance of grounding electric power tools.

SKILLS

* 1. Removing lid of can with paint can opener.

ø 2. Mixing stain with a stick prior to using.

ø 3. Mixing finishing materials with an electric drill.

ø 4. Thinning stain with solvent to make it lighter.

5. Adding dry powder or pigment to stain to make it darker.

6. Preparing a clean brush or small pieces of clean cloth to apply stain.

INFORMATION

1. Explaining the various types of stains, their advantages and disadvantages.

ø 2. Explaining the solvents for types of stains on the market.

Δ 3. Using an electric drill safely.

* 4. Providing proper ventilation in the work area.

* 5. Cleaning up the work area upon completion of the job.

Δ 6. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 7. Protecting oneself by wearing safety glasses.

TASK 6: PREPARING PAINT AND APPLICATORS FOR USE

COMMUNICATION

Δ 1. Reading instructions on a can for preparation of paint.

SCIENCE

Δ 1. Explaining the importance of grounding electric power tools.

SKILLS

* 1. Removing lid of can with paint can opener.

2. Preparing paint by mixing on a mechanical mixer.

ø 3. Mixing finishing materials with an electric drill.

ø 4. Preparing paint by stirring it.

5. Preparing paint by boxing it.

ø 6. Preparing paint for application by thinning according to manufacturer's instrsctions.

ø 7. Selecting proper width of brush according to area to be covered.

ø 8. Cleaning a brush by shaking out solvent and wiping it dry.

ø 9. Selecting proper width roller for area to be painted.

10. Selecting proper texture roller for finish desired.

INFORMATION

ø 1. Explaining proper thinners for various paints on the market.

Δ 2. Using an electric drill safely.

* 3. Providing proper ventilation in the work area.

Δ 4. Explaining added precautions when using electric tools if operator is in contact with the ground.

* 5. Cleaning up work area upon completion of the job.

Δ 6. Protecting oneself by wearing safety glasses.

TASK 7: PREPARING CLEAR FINISHES AND APPLICATORS FOR USE

COMMUNICATION

Δ 1. Reading directions on can for mixing and thinning.

SKILLS

1. Removing lid of can with a paint can opener.

ø 2. Stirring clear finishes before application.

ø 3. Thinning finishing material with proper solvent.

ø 4. Selection of proper applicator for job according to size of job and finish desired.

INFORMATION

1. Explaining finishes that are suitable for indoor or outdoor use.

ø 2. Explaining thinners suitable for various finishes.

3. Cleaning an applicator prior to use with a vacuum cleaner.

* 4. Providing proper ventilation in the work area.

* 5. Cleaning up the work area upon completion of the job.

Δ 6. Protecting oneself by wearing safety glasses.

TASK 8: CLEANING AND STORING BRUSHES, ROLLERS, AND PAINT CANS FOLLOWING USE

COMMUNICATION

Δ 1. Reading instructions on can of finish to determine proper solvent.

* 2. Cleaning rim of container free of finishing material.

* 3. Sealing lid to can with a hammer.

* 4. Cleaning hard paint from bristles near ferrule with a wire brush.

* 5. Washing brush or roller in thinner.

ø 6. Removing excess thinner from brush or roller by working it out on scrap wood or paper or by "whipping" it out.

7. Washing thinner from brush or roller with soap and water.

8. Storing brushes wrapped in paper to keep the bristles straight.

9. Softening hardened bristles with commercial preparations.

INFORMATION

1. Explaining types of preparations available for cleaning hard brushes.

2. Demonstrating how to store wet brushes.

* 3. Providing proper ventilation in the work area.

* 4. Cleaning up the work area upon completion of the job.

Δ 5. Protecting oneself by wearing:

   a. Safety glasses
   b. Gloves

TASK 9: GLAZING A WINDOW IN PREPARATION FOR PAINTING

COMMUNICATION

Δ 1. Reading instructions on glazing compound can.

MEASUREMENT

Δ 1. Measuring the size of an opening with a ruler accurate to the nearest 1/16 of an inch.

Δ 2. Measuring the thickness of glass with a ruler accurate to the nearest 1/32 of an inch.

SCIENCE

Δ 1. Explaining the importance of grounding electric power tools.

SKILLS

1. Removing putty with a putty softener and a putty knife.

2. Removing glazing paints with a putty knife.

3. Removing glass from opening with hammer, pliers and chisel.

4. Removing backing putty from sash with a putty knife.

* 5. Removing lid of can with paint can opener.

6. Preparing glazing compound by kneading in the hand.

7. Applying glazing compound to sash by hand to bed glass in.

8. Installing glass in the opening and bedding it in the glazing compound.

9. Installing glazing points with a hammer.

10. Glazing the window with a putty knife.

11. Removing surplus putty from around the glass.

INFORMATION

1. Explaining thickness of glass obtainable.

2. Explaining safe use of putty softener.

3. Cleaning hands and tools following installation of glass.

* 4. Cleaning up work area upon completion of the job.

Δ 5. Demonstrating safe use of a step ladder and an extension ladder.

Δ 6. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 7. Protecting oneself by wearing:

   a. Safety glasses
   b. Safety helmet
   c. Gloves

TASK 10: PREPARING JOINTS AND NAIL HOLES IN DRY WALL CONSTRUCTION TO RECEIVE FINAL FINISH

COMMUNICATION

Δ 1. Reading directions in order to mix cement properly.

SCIENCE

Δ 1. Explaining the importance of grounding electric power tools.

SKILLS

Δ 1. Countersinking any nail heads that stick above the paper with a round headed hammer.

ϕ 2. Covering nail heads with cement using a broad blade putty knife.

3. Applying layer of cement in joint with a broad putty knife.

4. Applying the perforated tape in the cement with a broad putty knife.

5. Applying a layer of cement over the tape with a curved trowel.

ϕ 6. Sanding the nail heads and joints when cement is dry with an orbital sander.

7. Applying topping cement to nail heads with a broad putty knife.

8. Applying topping cement to the joint with a curved trowel.

INFORMATION

ø 1. Explaining grades of sandpaper available.

* 2. Using a dust mask when sanding.

3. Explaining special purpose trowels available.

* 4. Cleaning up the work area upon completion of the job.

Δ 5. Demonstrating safe use of a step ladder.

Δ 6. Protecting oneself by wearing safety glasses.

TASK 11: APPLYING FINISHING MATERIALS TO PROVIDE PROTECTION AND DECORATION OF SURFACES IN OR ON A HOUSE

COMMUNICATION

Δ 1. Reading written instructions pertinent to application of finish.

MEASUREMENT

Δ 1. Measuring dimensions of object to be painted with a ruler accurate to nearest foot.

* 2. Dividing gallons into units as small as half pints.

MATHEMATICS

* 1. Multiplying to figure sq. ft. area of surface to be painted.

* 2. Dividing to find quantity of finish needed to cover area to be painted.

SKILLS

* 1. Removing hardware with a screwdriver prior to painting.

* 2. Applying finishing material with a brush.

3. Applying finishing material with a roller.

INFORMATION

ø 1. Selecting solvents for various finishing materials.

2. Explaining importance of using a step by step procedure in painting.

3. Explaining effect of humidity and temperature level on drying time.

ø 4. Explaining use of primers on new work.

* 5. Providing proper ventilation for safe work conditions.

* 6. Protecting surfaces and objects not to be painted with a drop cloth or masking.

* 7. Cleaning up work area upon completion of the job.

Δ 8. Demonstrating safe use of a step ladder and an extension ladder.

Δ 9. Protecting oneself by wearing:

   a. Safety glasses
   b. Safety shoes
   c. Safety helmets
   d. Gloves

PLUMBING

TASK 1: DIGGING A TRENCH FOR PLUMBING INSTALLATIONS

COMMUNICATION

* 1. Reading a blueprint to determine depth of trench and grade of bottom.

MEASUREMENT

Δ 1. Measuring grade of trench bottom with a level and rule accurate to 1/4 of an inch in 8 feet.

MATHEMATICS

* 1. Figuring the total grade for any distance when given the grade per foot.

SKILLS

* 1. Saving lawn sod from area of excavation by removing it with a shovel.

2. Loosening sod with a pick prior to removal from the trench.

* 3. Removing soil from the trench with a shovel.

* 4. Leveling bottom of trench to determine proper grade with a level and rule accurate to 1/4 of inch in 8 feet.

INFORMATION

ø 1. Working at a moderate rate of speed.

2. Preserving the removed sod so it can be used to recover the excavated area.

3. Placing excavated soil in position to make backfilling easy.

Δ 4. Protecting oneself by wearing:

    a. Safety shoes
    b. Safety helmets
    c. Gloves

TASK 2: BACKFILLING A TRENCH FOLLOWING INSTALLATION OF PLUMBING LINES

SKILLS

* 1. Covering lines with fine dirt first with a shovel to protect them from stones.

* 2. Packing loose dirt in the trench with a tamper.

3. Compacting earth with water.

4. Replacing sod on top of fill.

5. Cleaning up lawn areas with a rake.

6. Wetting down replaced sod with a hose.

INFORMATION

∅ 1. Working at a moderate rate of speed.

Δ 2. Protecting oneself by wearing:

a. Safety shoes
b. Gloves

TASK 3: PREPARING COPPER TUBING FOR INSTALLATION IN A PLUMBING SYSTEM FOR A HOUSE

COMMUNICATION

* 1. Reading a blueprint to determine length and diameter of tubing required.

MEASUREMENT

Δ 1. Measure tubing to length with a ruler to an accuracy of 1/8 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

SKILLS

* 1. Holding tubing with a vise for cutting and reaming.

* 2. Cutting tubing to length with a hack saw or tubing cutter to an accuracy of 1/8 of an inch.

* 3. Reaming copper tubing with a reamer.

* 4. Cleaning tubing preparatory to installation with a cloth and steel wool or emery cloth.

INFORMATION

* 1. Cleaning metals properly to make soldering easy.

* 2. Cutting tubing square in order to make good joints.

TASK 4: PREPARING THREADED PIPE FOR INSTALLATION IN A PLUMBING OR GAS SUPPLY SYSTEM

COMMUNICATION

* 1. Reading a blueprint to determine the length of pipe required.

MEASUREMENT

Δ 1. Measuring a piece of pipe to length with a ruler to an accuracy of 1/8 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

SCIENCE

Δ 1. Explaining the importance of grounding electrical equipment.

SKILLS

* 1. Holding pipe in a vise for cutting, reaming and threading.

* 2. Cutting pipe to length with hand cutter, hack saw and machine to an accuracy of 1/16 of an inch.

* 3. Reaming pipe to remove burr by hand and machine.

* 4. Cutting pipe thread with hand die.

* 5. Cutting pipe thread with power machine.

* 6. Changing die sizes on hand and power thread cutters.

* 7. Using cutting oil for cutting and threading pipe.

8. Cleaning pipe prior to installing by knocking out chips and wiping with a cloth.

INFORMATION

* 1. Cutting pipe square in order to make good joints.

* 2. Cutting thread proper length.

* 3. Cleaning the cutting, reaming and threading tools with a cloth.

Δ 4. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 5. Protecting oneself by wearing:

a. Safety glasses
b. Safety shoes
c. Gloves

TASK 5: PREPARING CAST IRON SOIL PIPE FOR POURING OF LEAD JOINT

COMMUNICATION

* 1. Reading a blueprint to determine length of pipe.

MEASUREMENT

Δ 1. Measuring length of pipe with a ruler to an accuracy of 1/8 of an inch.

Δ 2. Measuring total length of cast iron pipe and fittings to an accuracy of 1/8 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

SKILLS

1. Cutting cast iron pipe to length with a cutting tool to an accuracy of 1/8 of an inch.

* 2. Cutting cast iron pipe to length with a hammer and cold chisel to an accuracy of 1/8 of an inch.

3. Preparing oakum for packing a joint.

4. Positioning pipe in preparation for yarning.

5. Yarning oakum in the joint with a hammer and yarning iron.

6. Maintaining alignment of pipe while yarning the joint.

7. Placing pipe in a vertical position for pouring lead.

8. Attaching an asbestos gasket to soil pipe in order to pour the joint in a horizontal position.

INFORMATION

* 1. Removing mushroomed heads from chisels and yarning irons with a grinder.

Δ 2. Protecting oneself by wearing:

    a. Safety glasses
    b. Safety shoes
    c. Gloves

TASK 6: PREPARING LEAD FOR POURING SOIL PIPE JOINTS

COMMUNICATION

Δ 1. Reading instructions for lighting furnace.

SKILLS

* 1. Cutting lead with cold chisel and hammer.

2. Preparing furnace for lighting.

* 3. Lighting the heating furnace with a match or lighter.

4. Adding lead to molten metal.

INFORMATION

1. Explaining the differences in types of furnaces likely to be found on the job.

* 2. Removing mushroomed heads from a cold chisel with a grinder.

* 3. Ventilating the area where the furnace is located.

* 4. Protecting oneself and fellow workers from dangers of molten metal contacting moisture.

5. Observing the proper temperature of molten lead by its color.

Δ 6. Protecting oneself by wearing:

   a. Safety glasses
   b. Safety shoes
   c. Gloves

TASK 7: LAYING A DRAINAGE FIELD WITH A CLAY PIPE

COMMUNICATION

* 1. Reading a blueprint to determine grade of drainage field and prescribed method of laying pipe.

MEASUREMENT

Δ 1. Measuring grade of pipe with a level and rule to an accuracy of 1/4 of an inch in 8 feet.

SKILLS

* 1. Placing coarse gravel or crushed stone below pipe with a shovel.

* 2. Grading the stone with a hoe so that a grade accurate to 1/4 of an inch in 8 feet is obtained as measured by a level and rule.

3. Laying the pipe on top of the stone.

4. Covering joints in the pipe with tar paper.

* 5. Placing coarse gravel or crushed stone over pipe to required depth with a shovel.

6. Covering coarse gravel or crushed stone with tar paper prior to back filling.

INFORMATION

1. Explaining the reasoning behind maintaining proper grade when laying a drainage field.

Δ 2. Protecting oneself by wearing:

   a. Safety shoes
   b. Safety helmets
   c. Gloves

TASK 8: ATTACHING MOUNTING BRACKETS FOR PLUMBING FIXTURES TO FRAME CONSTRUCTION IN A HOUSE

COMMUNICATION

* 1. Reading a blueprint to determine location of plumbing fixtures.

MEASUREMENT

1. Locating center points on a wall using two measurements.

Δ 2. Measuring material for backing blocks with an accuracy of 1/16 of an inch.

SCIENCE

Δ 1. Explaining the importance of grounding electrical equipment.

SKILLS

* 1. Squaring cuts with a framing square to an accuracy of 1/16 of an inch.

* 2. Cutting backing blocks with power saws or hand saw to an accuracy of 1/16 of an inch.

Δ 3. Nailing backing blocks in place with a claw hammer using proper nailing pattern to an accuracy of 1/16 of an inch.

* 4. Drilling pilot holes with hand drill or electric drill for wood screws.

* 5. Attaching mounting bracket on a level position using a level and a screwdriver.

Δ 6. Removing bent nails with a bar or hammer.

INFORMATION

* 1. Using a screwdriver safely.

* 2. Locating framing members in an existing wall.

* 3. Using an adjustable wrench properly.

Δ 4. Using electric power tools safely.

Δ 5. Protecting oneself by wearing safety glasses.

TASK 9: ATTACHING MOUNTING BRACKETS FOR PLUMBING FIXTURES TO MASONRY CONSTRUCTION IN A HOUSE

COMMUNICATION

* 1. Reading instructions to obtain proper hole size for fastener to be used.

* 2. Reading a blueprint to determine location of fixture.

MEASUREMENT

Δ 1. Measuring to find location of hangers within an accuracy of 1/16 of an inch.

* 2. Locating center points on a wall using two measurements.

SCIENCE

Δ 1. Explaining the importance of grounding electrical equipment.

SKILLS

* 1. Drilling holes for fasteners with an electric drill.

* 2. Drilling holes for fasteners with a star drill and hammer.

* 3. Driving fastening devices with an impact tool.

* 4. Attaching mounting brackets in level position with a level and screwdriver or wrench.

INFORMATION

* 1. Selecting types of fasteners that best fit the requirements of the job.

* 2. Explaining advantages and disadvantages of various available fasteners.

* 3. Using an adjustable wrench properly.

* 4. Explaining method of installing each type of fastener.

* 5. Using a screwdriver safely.

* 6. Removing mushroomed heads from a star drill with a grinder.

Δ 7. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 8. Protecting oneself by wearing:

a. Safety glasses
b. Gloves

TASK 10: INSTALLING A WATER CLOSET SEAT IN A HOUSE

COMMUNICATION

* 1. Reading manufacturer's directions for installation.

MEASUREMENT

Δ 1. Measuring center to center distances to an accuracy of 1/16 of an inch.

SCIENCE

Ø 1. Exercising personal hygiene following completion of job.

SKILLS

* 1. Removing old closet seat with a wrench without damage to the toilet.

2. Cleaning water closet (with cloth and scouring powder) prior to installation of new seat.

* 3. Installing new seat with a wrench with soft washers in proper location.

4. Adjusting new seat to line it up and place it in balance.

INFORMATION

* 1. Using an adjustable wrench properly.

Ø 2. Protecting porcelain surfaces from damage with tools.

* 3. Protecting household property of the owner from damage.

* 4. Cleaning up the work area upon completion of the job.

TASK 11: INSULATING HEATING AND WATER LINES FOR ECONOMY AND APPEARANCE

COMMUNICATION

* 1. Reading blueprint to determine pipes to be insulated.

* 2. Reading manufacturer's instructions for installing insulation.

MEASUREMENT

Δ 1. Measuring the length of the insulation with a rule to an accuracy of 1/8 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

SKILLS

1. Cutting insulation to length with a fine saw or knife to an accuracy of 1/8 of an inch.

2. Attaching insulation to pipes with metal bands.

ø 3. Mixing asbestos cement for fittings with a trowel.

4. Applying asbestos cement around fittings by hand.

5. Wrapping asbestos cement with cloth to hold it in position.

Δ 6. Demonstrating safe use of a step ladder.

INFORMATION

Δ 1. Protecting oneself by wearing gloves.

TASK 12: ASSEMBLING A FURNACE USING WRITTEN INSTRUCTIONS

COMMUNICATION

* 1. Reading manufacturer's directions for assembly.

SCIENCE

Δ 1. Explaining the importance of grounding electrical equipment.

SKILLS

* 1. Assembling sections, lock washers placed properly, with a screwdriver and pliers.

* 2. Drilling holes for bolts and sheet metal screws with an electric drill.

ø 3. Mixing fire clay with a trowel for laying up fire brick.

* 4. Leveling the furnace unit with a level.

* 5. Removing crating material without damage to contents with a claw hammer and pry bar.

INFORMATION

Δ 1. Removing nails from crating material with a hammer to preserve safe working conditions.

* 2. Using a screwdriver safely.

* 3. Cleaning up the work area upon completion of the job.

Δ 4. Using electric power tools safely.

Δ 5. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 6. Protecting oneself by wearing:

    a. Safety glasses
    b. Safety shoes
    c. Gloves

TASK 13: INSTALLING DUCT WORK FOR WARM AIR HEATING SYSTEMS

COMMUNICATION

* 1. Reading a blueprint to determine location of ductwork.

MEASUREMENT

Δ 1. Measuring sheet metal to size with a ruler to an accuracy of 1/16 of an inch.

SCIENCE

Δ 1. Explaining the importance of grounding electrical equipment.

SKILLS

1. Making sheet metal hangers for duct work with shears, bar folder, brake or improvised bending equipment.

Δ 2. Attaching hangers to framing members with a hammer.

Δ 3. Removing bent nails with a bar or hammer.

4. Assembling seams of prefabricated duct work.

* 5. Fastening sheet metal together with sheet metal screws and a screwdriver.

* 6. Drilling holes in sheet metal by hand and with an electric drill.

* 7. Cutting sheet metal to size by hand with straight snips or aviation snips within an accuracy of 1/16 of an inch.

8. Bending sheet metal by hand using a mallet, hand seamer, or other improvised methods.

9. Making seams in sheet metal using hand methods.

INFORMATION

* 1. Using a screwdriver safely.

2. Using soft faced tools for shaping sheet metal.

* 3. Cleaning up the work area upon completion of the job.

Δ 4. Using electric power tools safely.

Δ 5. Demonstrating safe use of a step ladder.

Δ 6. Explaining added precautions when using electric tools if operator is in contact with the ground.

Δ 7. Protecting oneself by wearing:

   a. Safety glasses
   b. Safety helmets
   c. Gloves

TASK 14: INSTALLING PLASTIC PIPE FOR PLUMBING LINES FOR A HOUSE

COMMUNICATION

* 1. Reading a blueprint to determine length of pipe, placement of fittings and location of installation.

MEASUREMENT

Δ 1. Measuring length of pipe with a ruler to an accuracy of 1/8 of an inch.

MATHEMATICS

* 1. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

SKILLS

1. Cutting pipe to length with a knife to an accuracy of 1/8 of an inch.

2. Softening pipe in hot water prior to installation.

* 3. Attaching required fittings in place with a screwdriver or with press fit.

4. Fastening pipe in place with pipe hangers.

INFORMATION

1. Using plastic pipe only in places and for uses for which it was intended.

* 2. Using a screwdriver safely.

Δ 3. Demonstrating safe use of a step ladder.

Δ 4. Protecting oneself by wearing:

   a. Safety glasses
   b. Safety shoes
   c. Safety helmets
   d. Gloves

TASK 15: SOLDERING SHEET METAL AND COPPER TUBING TO BE USED IN A HOME

COMMUNICATION

Δ 1. Interpreting solder and fluxing composition from manufacturer's specifications.

SCIENCE

1. Explaining the composition of solder.

* 2. Protecting L P soldering equipment from oil.

* 3. Explaining the need for fluxing action.

  4. Explaining the precautions to take when using acid flux.

SKILLS

* 1. Cleaning metal preparatory to soldering with a file, emery cloth or steel wool.

  2. Tinning a surface with a soldering copper or other soldering device.

* 3. Soldering with a flame or soldering copper.

  4. Cleaning excess solder from the job with a cloth.

  5. Sweating two pieces of metal together with soldering equipment.

  6. Tacking sheet metal prior to soldering.

INFORMATION

* 1. Using various sorts of heat for soldering.

  2. Using proper fluxes for various metals.

* 3. Handling L P torch and accessories with care.

* 4. Protecting oneself and others from hot metal.

Δ 5. Demonstrating safe use of a step ladder and extension ladder.

Δ 6. Protecting oneself by wearing safety glasses.

TASK 16: REPAIRING LEAKS IN A WATER CLOSET IN A HOUSE

COMMUNICATION

* 1. Reading manufacturer's directions on repair parts.

SKILLS

ø 1. Shutting off the water supply.

B

2. Adjusting float valve with pliers and screwdriver for proper storage level in the tank.

3. Adjusting tank flush valve to prevent leaking.

4. Adjusting tank lever action to achieve smooth action.

* 5. Adjusting tank ball with pliers and screwdriver for proper flotation and seating of the tank ball.

6. Replacing and adjusting a tank ball in a water closet.

7. Adjusting the float to change the water storage level.

INFORMATION

* 1. Protecting household property of the owner from damage.

ø 2. Protecting porcelain surfaces from damage with tools.

* 3. Cleaning up the work area upon completion of the job.

* 4. Using a screwdriver safely.

TASK 17: REPAIRING LEAKS IN FAUCETS IN A HOUSE

COMMUNICATION

* 1. Reading manufacturer's directions on repair parts.

MEASUREMENT

Δ 1. Measuring washer size with a ruler to an accuracy of 1/32 of an inch.

SKILLS

ø 1. Shutting off the water supply.

2. Turning faucet handle to "on" position.

* 3. Removing handle with a screwdriver if necessary.

* 4. Removing faucet assembly with a wrench.

* 5. Replacing faucet washer with a screwdriver.

6. Replacing packing around stem if necessary.

* 7. Reassembling faucet assembly with a wrench.

* 8. Adjusting the packing nut with a wrench.

* 9. Removing a swing faucet with a wrench.

10. Replacing the washer on a swing faucet.

*11. Reassembling a swing faucet with a wrench.

INFORMATION

0 1. Protecting porcelain surfaces from damage with tools.

* 2. Protecting household property of the owner from damage.

3. Using a faucet properly to preserve washer life.

* 4. Using a screwdriver safely.

* 5. Using an adjustable wrench properly.

* 6. Cleaning up the work area upon completion of the job.

0 7. Protecting polished fittings from wrench jaws with soft metal, cloth, fiber or cardboard.

TASK 18: CLEANING WASTE LINES WITH A SNAKE

COMMUNICATION

* 1. Reading a blueprint to locate clean out plugs in waste lines.

SCIENCE

0 1. Exercising proper personal hygiene following completion of work.

SKILLS

* 1. Removing a clean out plug from a trap with a wrench.

*2. Cleaning out a trap from the clean out hole with a wire.

* 3. Replacing a clean out plug in a trap with a wrench.

* 4. Disconnecting a trap with a wrench.

5. Cleaning a waste line from a sink or lavatory with a snake.

* 6. Connecting a trap with a wrench.

* 7. Removing clean out plugs from soil pipe lines with a wrench.

8. Cleaning out soil pipe lines with a snake.

* 9. Replacing clean out plugs in a soil pipe with a wrench.

10. Cleaning a snake following use with a cloth.

11. Oiling a snake following use to prevent rust.

12. Replacing gaskets on traps and clean out plugs.

INFORMATION

* 1. Protecting household property of the owner from damage.

2. Tightening traps and clean out plugs snugly without undue force.

3. Recognizing various types of snakes available for cleaning out waste lines.

* 4. Using an adjustable wrench properly.

ø 5. Protecting polished fittings from wrench jaws with soft metal, cloth, fiber or cardboard.

Δ 6. Demonstrating safe use of a step ladder.

* 7. Cleaning up the work area upon completion of the job.

Δ 8. Protecting oneself by wearing gloves.

TASK 19: WELDING ANGLE IRON FOR PIPE HANGERS

COMMUNICATION

Δ 1. Reading instructions for assembling gas welding equipment.

MEASUREMENT

Δ 1. Measuring length of hanger with a ruler to nearest 1/8 of an inch.

SCIENCE

* 1. Protecting gas welding equipment from contact with oil.

2. Explaining basic principles of welding metal.

SKILLS

1. Setting up equipment with a wrench preparatory to welding.
2. Turning gas on with regulator at beginning of operation.
3. Lighting torch correctly with a sparker.
4. Adjusting flame to neutral.
5. Laying a bead with welding rod and torch.
6. Cleaning a bead with chipping hammer and brush.
7. Shutting off flame properly.
8. Shutting down equipment at end of operation.

INFORMATION

1. Selecting proper rod for the job.

* 2. Protecting oneself and others from hot metal.

3. Protecting rubber tubing when welding.

* 4. Ventilating the area to provide safe working conditions.

Δ 5. Protecting oneself by wearing:

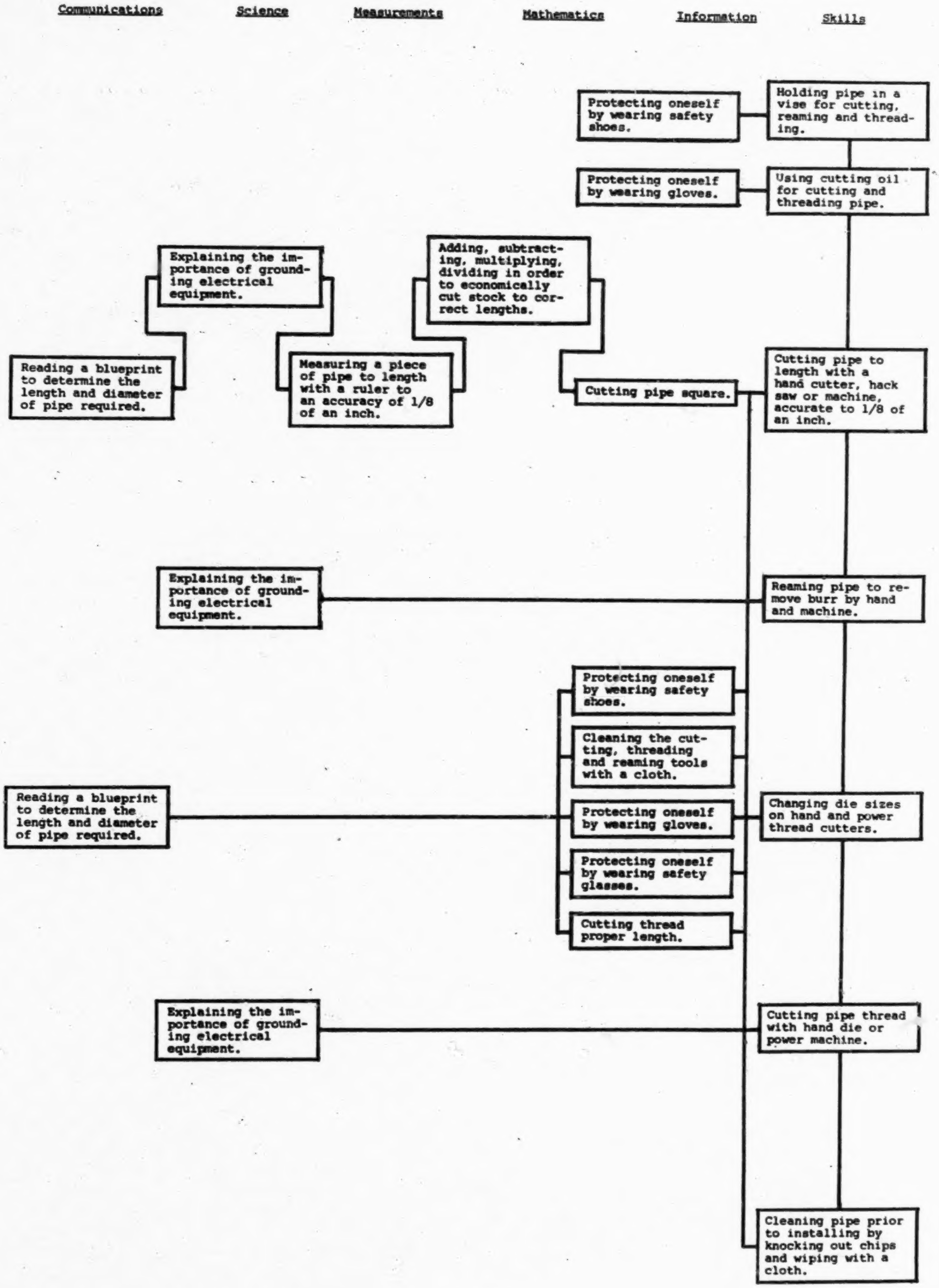
   a. Safety glasses
   b. Safety shoes
   c. Safety helmets
   d. Gloves

INSTRUCTIONAL SEQUENCE EXAMPLE

CONSTRUCTION

This section of the report provides a suggested instructional sequence that may be utilized by the teacher in developing a lesson for each of the tasks listed in the task analysis section of the report. The task is shown at the top of the page with the headings for the areas of human requirement listed below the task. Under each heading the behavioral statements have been arranged in a suggested instructional sequence. The arrangement provides the teacher with an instructional pattern that can be used to develop lesson plans, materials of instruction, and visual aids.

PREPARING THREADED PIPE FOR INSTALLATION IN A PLUMBING OR GAS SUPPLY SYSTEM IN A HOUSE


Communications
Science
Measurements
Mathematics
Information
Skills
Protecting oneself by wearing safety shoes.
Holding pipe in a vise for cutting, reaming and threading.
Protecting oneself by wearing gloves.
Using cutting oil for cutting and threading pipe.
Explaining the importance of grounding electrical equipment.
Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.
Reading a blueprint to determine the length and diameter of pipe required.
Measuring a piece of pipe to length with a ruler to an accuracy of 1/8 of an inch.
Cutting pipe square.
Cutting pipe to length with a hand cutter, hack saw or machine, accurate to 1/8 of an inch.
Explaining the importance of grounding electrical equipment.
Reaming pipe to remove burr by hand and machine.
Protecting oneself by wearing safety shoes.
Cleaning the cutting, threading and reaming tools with a cloth.
Reading a blueprint to determine the length and diameter of pipe required.
Protecting oneself by wearing gloves.
Changing die sizes on hand and power thread cutters.
Protecting oneself by wearing safety glasses.
Cutting thread proper length.
Explaining the importance of grounding electrical equipment.
Cutting pipe thread with hand die or power machine.
Cleaning pipe prior to installing by knocking out chips and wiping with a cloth.

COMMON AREAS OF HUMAN REQUIREMENT

CONSTRUCTION

An inventory of skills and knowledges was compiled for each of the occupations in the construction cluster. An analysis of these skills and knowledges was made to determine their frequency of appearance for each of the occupations in the cluster. The frequency of appearance is shown with respect to the following categories:

1. Common to all occupations.

2. Common to several occupations.

AREAS OF HUMAN REQUIREMENT COMMON TO ALL OCCUPATIONS IN THE CONSTRUCTION CLUSTER

AREAS OF HUMAN REQUIREMENT	PAINTER	ELECTRICIAN	CARPENTER	MASON	PLUMBER
COMMUNICATION					
1. Reading instructions, manuals or directions for specific material usage.	9	12	6	1	3
MEASUREMENT					
1. Measuring with a rule or tape. . . .	3	10	31	13	13
SCIENCE					
1. Explaining the importance of grounding electric tools	8	9	23	12	4
SKILLS					
1. Using a hammer to drive and draw nails.	5	9	34	10	3
INFORMATION					
1. Demonstrating safe use of extension or step ladders	7	12	28	11	5
2. Handling electric power tools safely .	2	9	25	9	5
3. Explaining added precautions when using electric tools if the operator is in contact with the ground. . .	7	7	16	12	4
4. Protecting oneself by wearing safety glasses	11	12	34	15	10
5. Protecting oneself by wearing safety shoes.	1	2	33	15	8

AREAS OF HUMAN REQUIREMENT	PAINTER	ELECTRICIAN	CARPENTER	MASON	PLUMBER
6. Protecting oneself by wearing safety helmet.	2	4	20	13	4
7. Protecting oneself by wearing gloves. .	6	4	21	21	13

AREAS OF HUMAN REQUIREMENT COMMON TO SEVERAL OCCUPATIONS IN THE CONSTRUCTION CLUSTER

AREAS OF HUMAN REQUIREMENT	PAINTER	ELECTRICIAN	CARPENTER	MASON	PLUMBER
COMMUNICATION					
1. Reading a blueprint to determine size.	0	2	12	3	6
2. Reading a blueprint to determine location	0	10	16	5	6
3. Reading a blueprint to determine recommended method of construction or installation	0	2	12	10	8
4. Receiving verbal instructions for carrying out the job	0	0	4	1	0
MEASUREMENT					
1. Dividing gallons into units as small as half pints	1	0	0	1	0
2. Locating center point on a wall using two measurements.	0	0	1	0	2
MATHEMATICS					
1. Adding, subtracting, dividing, multiplying, in order to economically cut stock to correct lengths	1	17	0	4	5
2. Multiplying to find area	2	0	4	2	1
3. Dividing to find quantity of material needed.	2	0	1	3	0
SCIENCE					
1. Protecting L P soldering equipment from oil	0	4	0	0	2

AREAS OF HUMAN REQUIREMENT

SKILLS	PAINTER	ELECTRICIAN	CARPENTER	MASON	PLUMBER
1. Using a screwdriver to drive and remove threaded fasteners.	5	11	3	0	7
2. Cutting metal with a hack saw . . .	0	4	2	0	2
3. Drilling with an electric drill. . .	0	8	5	2	4
4. Drilling with a star drill	0	0	1	0	1
5. Using a level for plumbing and leveling	0	2	7	5	5
6. Cutting wood with a power saw or hand saw	0	7	20	8	1
7. Bracing wooden structures.	0	1	3	5	0
8. Sharpening stakes with a saw or axe	0	1	1	5	0
9. Driving stakes with a sledge hammer .	0	2	1	5	0
10. Squaring and measuring with a framing square.	0	7	26	8	1
11. Using a cold chisel for removing and cutting material	0	0	0	4	2
12. Reaming tubing, pipe and conduit with a reamer.	0	1	0	0	2
13. Lighting a heating furnace	0	0	0	1	1
14. Holding tubing, conduit or pipe in a vise	0	1	0	0	2
15. Using an adjustable wrench for loosening and tightening bolts, plugs, nuts, etc.	0	1	5	2	5
16. Using a pipe wrench to install pipe, conduit or fittings.	0	1	0	0	2

AREAS OF HUMAN REQUIREMENT	PAINTER	ELECTRICIAN	CARPENTER	MASON	PLUMBER
17. Driving fastening devices with an impact tool.	0	1	2	0	1
18. Cutting pipe, tubing or conduit with a hand cutter or by machine.	0	1	0	0	2
19. Cutting thread on conduit or pipe by hand or by machine	0	1	0	0	1
20. Changing die sizes on hand and power thread cutters.	0	1	0	0	1
21. Using cutting oil for cutting and threading pipe and conduit.	0	1	0	0	1
22. Moving material with a shovel.	0	1	0	4	3
23. Cleaning metal prior to soldering	0	3	0	0	2
24. Cutting metal with hand shears	0	0	2	0	1
25. Using a wire brush for cleaning	2	0	1	7	0
26. Applying finishes and waterproofer with a brush	2	0	0	1	0
27. Resealing a can of finishing material with a hammer.	1	0	0	2	0
28. Cutting wire to proper length with side cutting pliers	0	6	0	1	0
29. Locating framing members of a house by sounding.	0	1	1	0	1
30. Opening finishing materials with a patented opener	4	0	0	1	0
31. Cleaning rim of container free of finishing material	1	0	0	1	0
32. Placing blocks under scaffolding posts to prevent them from sinking into the ground	0	0	1	1	0

AREAS OF HUMAN REQUIREMENT	PAINTER	ELECTRICIAN	CARPENTER	MASON	PLUMBER
33. Packing loose dirt with a tamper when replacing soil in an excavation. . .	0	1	0	0	1
34. Mixing ingredients for concrete with a hoe.	0	0	1	1	0
35. Applying asphalt with a brush . . .	0	0	2	1	0
36. Cleaning asphalt from a brush . . .	0	0	1	1	0
37. Cleaning a brush in solvent following use.	1	0	0	1	0
INFORMATION					
1. Cleaning up work area following completion of job	3	0	0	0	6
2. Soldering with a flame or soldering gun	0	1	0	0	1
3. Checking scaffold lumber for weak spots caused by knots or grain defects . .	0	0	1	1	0
4. Understanding that scaffold must support workers plus materials.	0	0	1	1	0
5. Explaining advantages and disadvantages of various available fasteners . . .	0	0	1	1	0
6. Ventilating an area for safe working conditions.	7	0	0	1	1
7. Protecting personal property of owner.	2	0	0	1	4
8. Explaining need for fluxing action. .	1	0	0	0	1
9. Removing mushroomed heads from chisels, yarning irons, and star drills . . .	0	0	1	4	3
10. Using a screwdriver safely	4	11	3	0	5
11. Selecting proper type fasteners for job.	0	0	1	0	1

AREAS OF HUMAN REQUIREMENT	PAINTER	ELECTRICIAN	CARPENTER	MASON	PLUMBER
12. Explaining method of installing fasteners in masonry.	0	1	1	0	1
13. Safety precautions around hot materials	0	4	0	0	3
14. Using an adjustable wrench properly.	0	1	5	2	5
15. Cutting pipe, tubing or conduit square	0	1	0	0	2
16. Cutting thread proper length . . .	0	1	0	0	1
17. Cleaning the cutting, reaming, and threading tools following use. . .	0	1	0	0	1
18. Using various sorts of heat for soldering	0	4	0	0	1
19. Handling L P torch and accessories with care	0	4	0	0	1
20. Applying finishes and waterproofer with a brush	2	0	0	2	0
21. Using a dust mask.	5	0	0	1	0

COURSE OUTLINE

CONSTRUCTION

This section of the report includes the course outline for the construction cluster. The course outline is divided into a first and second level program. Units of instruction have been developed that provide the manipulative and verbal learnings required for job entry into each of the occupations found in the cluster. A list of suggested learning activities has been provided for each unit as well as a list of instructional materials for each occupational area.

COURSE DESCRIPTION: The course outline for the occupational cluster of construction is designed to be used in a cluster concept program in vocational education at the secondary school level. The program is aimed at the development of skills and understandings related to a group of occupations within the construction cluster. It is not an in-depth development into any one occupation, but aims at preparing students to enter a range of occupations within the construction cluster.

NEED FOR THE COURSE: The course is designed to meet the needs of students pursuing a general curriculum in the secondary school system by providing job entry skills in a number of related occupations. It is also designed to meet the student's need for self appraisal of interests and potentialities in a number of occupations.

Specific needs include the following:

1. To provide students with the opportunity for a greater degree of mobility on a geographical basis.
2. To provide students with the opportunity for mobility within an industry or occupation.
3. To provide students with the opportunity for greater flexibility in occupational choice patterns.
4. To develop students who will be adaptable to technological changes.

COURSE OBJECTIVES: The course for the construction cluster will be directed toward the following objectives:

1. To broaden the student's knowledge of the available opportunities in occupations found in the construction cluster.

2. To develop job entry skills and knowledge for several occupations found in the construction cluster.
3. To develop safe habits and a favorable attitude toward work in the construction cluster.
4. To develop a student's insight into the sources of information that will be helpful to him as he moves through the occupational areas.

The specific objectives for the course are the following:

1. To develop the student's competency in the use of common hand tools found in the construction cluster.
2. To develop the student's competency in using power tools and equipment needed for job entry into the occupations found in the construction cluster.
3. To develop the student's understanding of the operations, procedures, and processes associated with the construction cluster.
4. To develop safe working habits related to the occupations within the construction cluster.
5. To familiarize the student with the terminology associated with the construction cluster.
6. To develop an understanding of the resources available to him in his pursuit of the course as well as in his work following graduation.

PROCEDURE: It is recommended that the course be offered during the student's junior and senior year in high school. Instruction should be provided for two periods a day, five days a week, during the school year. The Level I experiences were designed for the junior year (or first year) program and the Level II experiences were designed for the second year or senior year program.

The most appropriate facility would be a self-contained laboratory unit containing the essential tools and equipment necessary for teaching job entry tasks in the construction cluster.

The instructor should be a person with some experience and competence in the occupations included in the cluster. The course should be organized by the teacher on a multiple activity basis with groups of students rotating through the specific occupational areas. The common areas of human requirement needed to perform the tasks in the cluster should be emphasized so that an opportunity is provided for the students to transfer the common skill or knowledge from one occupation to another.

The possibility of team teaching procedures would be appropriate for the construction cluster. Specialists in the different occupational areas would participate in the instructional program. The team teachers could be other vocational teachers as well as competent individuals from the community.

The instructor of the course should coordinate his program with other teachers in the school to develop the competencies in mathematics, science, and communication that will be needed for successful performance in the occupations found in the construction cluster. Community resources, such as local industries, employment agencies, and tradesmen should be utilized to provide occupational information and knowledge needed concerning the performance of the tasks in the construction occupations.

The course should be supplemented with field trips, films, and other educational media. A suggested list is provided at the end of each occupational area in the course outline.

LEVEL I EXPERIENCES

FIRST YEAR PROGRAM

CARPENTRY EXPERIENCES - - LEVEL I

Unit I

Title: Fabrication and Erection of Supporting Wood Structural Units in House Construction.

Objective: To develop in the individual the capability for erecting columns and girders, box sills, floor joists and bridging according to tolerances specified by the job.

Manual or Manipulative Learning:

A. Laying out square and bevel cuts with a framing square to an accuracy of 1/16 of an inch.
B. Cutting stock with a hand or power saw to an accuracy of 1/16 of an inch.
C. Nailing stock in place with a hammer to an accuracy of 1/16 of an inch
D. Removing bent nails with a bar or hammer.
E. Drilling holes in wood with a hand drill or power drill to an accuracy of 1/16 of an inch.
F. Using a screwdriver to drive threaded fasteners.
G. Leveling and plumbing with a level to an accuracy of 1/16 of an inch.
H. Using an adjustable wrench to attach sill plates and hardware.
I. Checking framing lumber for "crowns" and assembling them accordingly.

Verbal Learning:

Communication:

A. Reading a blueprint to determine size, type, location of framing members and hardware.

Measurement:

A. Measuring with a steel tape or folding rule to an accuracy of 1/16 of an inch.

Mathematics:

A. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct length.

Science:

A. Explaining span limits of structural members.

J. Nailing cross bridging in place at top only-offsetting solid bridging when nailing in place.

B. Explaining the importance of grounding electric tools.
C. Explaining the strength gained by using triangular structures.

General Information:

A. Explaining when bridging should be nailed in place.
B. Explaining the function of bridging.
C. Demonstrating safe use of step and extension ladders.
D. Wearing safety apparel appropriate to the job (glasses, shoes, helmets, gloves).
E. Providing ventilation for enclosed foundations exposed to the earth.
F. Using an adjustable wrench properly.
G. Explaining added precautions when using electric tools if the operator is in contact with the ground.
H. Explaining how to prevent rot in pockets at end of the girder.
I. Explaining why girders are crowned.
J. Explaining the nailing pattern used in building up a girder.

Suggested Student Activities:

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Nailing up a built-up girder.
B. Framing a boxsill for a home.
C. Installing hangers and anchors for floor joists.
D. Erecting the columns and main girder of a house.
E. Erecting floor joists for a house.
F. Installing cross and solid bridging between floor joists.
G. Using lumber of correct size as determined from reading a blueprint.

H. Erecting framing members in proper locations as determined from reading a blueprint.
I. Measuring and cutting lumber to an accuracy of 1/16 of an inch.
J. Cutting stock so that left over pieces are kept to a minimum.
K. Drawing a table of load limits of structural members for straight spans.
L. Drawing a diagram showing the function of bridging in distributing a load.

CARPENTRY EXPERIENCES - - LEVEL I

Unit II

__Title__: Fabrication and Erection of Partitions in House Construction.

__Objective__: To develop in the individual the capabilities of laying out stud spacing, assembling partitions and erecting wall sections.

__Manual or Manipulative Learning__:

A. Squaring members with a framing square to an accuracy of 1/16 of an inch.
B. Laying out stud locations with a framing square to an accuracy of 1/16 of an inch.
C. Laying out stock pieces on the floor according to a blueprint or plan.
D. Nailing members together with a hammer to an accuracy of 1/16 of an inch.
E. Raising partition to upright position from floor by hand.
F. Nailing wall sections to floor with a hammer to an accuracy of 1/16 of an inch.
G. Plumbing partition with a level to an accuracy of 1/16 of an inch.
H. Nailing on temporary diagonal bracing with a hammer for support.
I. Removing bent nails with a bar or hammer.

__Verbal Learning__:

__Communication__:

A. Reading a blueprint to determine location of framing members, sizes of openings and stud spacing.

__Measurement__:

A. Measuring stud spacing with a steel tape or folding ruler to an accuracy of 1/16 of an inch.

__Mathematics__:

A. Adding and subtracting whole numbers and fractions to determine stud placement for openings.

General Information:

A. Recognizing the proper size nails to be used.
B. Demonstrating various ways of framing a partition or wall.
C. Wearing safety apparel appropriate to job (glasses, shoes, helmets, gloves).

Suggested Student Activities:

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Laying out stud spacing with a ruler and framing square using a blueprint to determine proper location.
B. Assembling partitions with a hammer and nails.
C. Erecting partitions and plumbing them with a level to an accuracy of 1/16 of an inch.
D. Bracing partitions with diagonal members.

Unit III

Title: Application of Sheathing and Subflooring in House Construction.

Objective: To develop in the individual the capability for applying sheathing and subflooring to complete rough framing and add stability to the structure.

Manual or Manipulative Learning:

A. Laying out square and diagonal cuts with a framing square to an accuracy of 1/16 of an inch.
B. Cutting boards to size with a hand or power saw to an accuracy of 1/16 of an inch.
C. Nailing boards to framing members with a hammer to an accuracy of 1/16 of an inch.
D. Staggering the joints of boards for added strength.
E. Placing the boards on the joists to allow for expansion caused by water and humidity.
F. Pulling crooked boards into place with a pry bar.
G. Installing cross joint blocks for plywood with a hammer.
H. Removing bent nails with a bar or hammer.

Verbal Learning:

Communication:

A. Reading a blueprint to determine type of sheathing, proper thickness and method of application.

Measurement:

A. Measuring boards to length and width with a steel tape or folding rule to an accuracy of 1/16 of an inch.

Mathematics:

A. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

General Information:

A. Recognizing different materials used for sheathing and subflooring.
B. Recognizing various thicknesses and widths of sheathing and subflooring.
C. Demonstrating nailing patterns for plywood.
D. Demonstrating two methods of applying sheathing and rough flooring boards.
E. Using electric power tools safely.
F. Handling plywood with care in windy weather.
G. Explaining added precautions when using electric tools if operator is in contact with the ground.
H. Demonstrating safe use of step and extension ladders.
I. Wearing safety apparel appropriate to job (glasses, shoes, helmets, gloves).

Suggested Student Activities:

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Identifying types and sizes of sheathing on sight.
B. Laying out cuts with a ruler and steel square to an accuracy of 1/16 of an inch.
C. Cutting stock to size with a hand or power saw to an accuracy of 1/16 of an inch.
D. Nailing boards and cross joint blocks in place with a hammer to an accuracy of 1/16 of an inch.

CARPENTRY EXPERIENCES - - LEVEL I

Unit IV

Title: Installation of Insulation and Interior Sheathing in House Construction.

Objective: To develop in the individual the capability for installing insulation, wall backing, dry-wall and lath for a house.

Manual or Manipulative Learning:

- A. Squaring building material with a framing square to an accuracy of 1/16 of an inch.
- B. Cutting insulation and dry-wall with a knife to an accuracy of 1/16 of an inch.
- C. Cutting building material with a hand or power saw to an accuracy of 1/16 of an inch.
- D. Using a jig to cut a number of pieces of building material the same length.
- E. Nailing building material in place with a hammer to an accuracy of 1/16 of an inch.
- F. Removing bent nails with a bar or hammer.
- G. Stapling insulation in place with a stapling hammer.
- H. Pouring and blowing loose insulation between framing members.

Verbal Learning:

Communication:

- A. Reading the instructions for installation.

- B. Reading a blueprint to determine the location, size and type of building material specified for the job.

Measurement:

- A. Measuring building material with a folding rule or steel tape to an accuracy of 1/16 of an inch.

Mathematics:

- A. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

I. Drawing a sketch of the location of the backing before sealing up the wall.
J. Constructing a scaffold using saw horses and planks.
K. Cutting metal lath with tin snips to an accuracy of 1/8 of an inch.
L. Placing wallboard in position using a level.
M. Nailing dry-wall in place with a hammer starting at the center and working outward being careful not to break the paper surface.
N. Locating framing members of a house by measuring or sounding.
O. Applying adhesive for the second layer of dry-wall with a serrated trowel.
P. Pressing dry-wall into place with wooden braces while glue is drying.

Science:

A. Describing how heat travels from one point to another.

B. Describing the theory and principle of insulation.

General Information:

A. Using electric power tools safely.
B. Demonstrating safe use of step ladder.
C. Describing the three main types of lath (gypsum, wood, metal).
D. Recognizing the various types, sizes, and thicknesses of building materials and insulation.
E. Placing the beveled edge of the dry-wall in the most appropriate position.
F. Leaving room between the sheets of dry-wall for expansion.
G. Using the proper nailing pattern on dry-wall and lath.
H. Applying the dry-wall on the ceiling first.
I. Wearing the safety apparel appropriate to the job (glasses, shoes, helmets, gloves).

Suggested Student Activities:

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Measuring dry-wall in order to locate cut-outs for electrical outlets.
B. Placing backing blocks in partitions according to location specified on a blueprint.
C. Grounding electric tools before using them.
D. Applying dry-wall, lath and insulation to the ceilings.
E. Applying dry-wall, lath and insulation to the walls.
F. Cutting dry-wall, lath and insulation to size.
G. Gluing dry-wall in place when making a double thickness installation.

CARPENTRY EXPERIENCES - - LEVEL I

Unit V

Title: Supporting Operations for Fabrication and Erection of Structural Units in House Construction.

Objective: To develop in the individual the capability for mixing mortar, building a saw horse, cutting building material to length and applying building paper.

Manual or Manipulative Learning:

A. Mixing ingredient for mortar with a hoe.
B. Cleaning tools with water and a wire brush following use with mortar.
C. Laying out square and angle cuts with a framing square to an accuracy of 1/16 of an inch.
D. Cutting building material to size with a hand or power saw to an accuracy of 1/16 of an inch.
E. Nailing building material together with a hammer to an accuracy of 1/16 of an inch.
F. Removing bent nails with a hammer.
G. Constructing a fixture for cutting multiple pieces the same size to an accuracy of 1/16 of an inch.
H. Cutting building paper to size with a knife.
I. Fastening building paper in place with a stapling hammer.

Verbal Learning:

Communication:

A. Reading instructions to determine procedure.

B. Reading a blueprint to determine size and type of building material specified.

Measurement:

A. Measuring building material with a folding rule or steel tape to an accuracy of 1/16 of an inch.

Mathematics:

A. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

J. Eliminating large wrinkles in building paper by cutting them and restapling them.

B. Halving, doubling and tripling the proportions to suit the quantity of mortar needed.

General Information:

A. Explaining the necessity of measuring ingredients accurately when mixing mortar.
B. Checking a saw horse on a level surface to see if the legs are of equal length.
C. Using electric power tools safely.
D. Explaining added precautions when using electric tools if operator is in contact with the ground.
E. Recognizing the various types of building materials.
F. Measuring the total length of material in one step rather than in multiples of shorter measurements.
G. Wearing safety apparel appropriate to the job (glasses, shoes, helmets, gloves).
H. Explaining the various kinds of building paper (tarred felt, paraffin saturated, laminated kraft and foil).
I. Explaining the pruposes of using building paper (waterproofing, reducing infiltration of air and dust, noise suppression).

Suggested Student Activities:

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Mixing a batch of mortar according to written instructions.
B. Constructing a saw horse.
C. Constructing a trestle.

D. Constructing a jig for cutting multiple pieces of building material the same length to an accuracy of 1/16 of an inch.
E. Cutting building material to length to an accuracy of 1/16 of an inch.
F. Applying building paper to the rough floors and sidewalls of a house.
G. Drawing up a table for the amount of ingredients used in a half, double and triple size mix of mortar.
H. Identifying various types of building materials.
I. Listing the number and size of pieces needed for a saw horse as specified on a plan.

CARPENTRY EXPERIENCES - - LEVEL I

Unit VI

Title: Occupational Information Pertaining to Carpentry and Related Occupations.

Objective: To acquaint the individual with the opportunities in carpentry and related occupations.

Occupational Information

Obtaining information about:

A. The employment outlook.
B. The wage scale.
C. The types of training available.
D. The working conditions experienced in the occupation.
E. The physical and mental characteristics needed for qualification for employment.
F. The geographical location of employment.
G. The opportunities for advancement.
H. The advantages and disadvantages of the occupation.
I. The nature of the work involved in the occupation.
J. The union involvement in the occupation.
K. The means of entry into the occupation.

Suggested Student Activities

A. Writing specific information concerning opportunities in carpentry and related occupations.
B. Visiting an office of the State Employment Service.
C. Listening to a speaker from a trade union.
D. Writing letters to correspondence and trade schools in order to determine opportunities for additional training.
E. Visiting a school for apprentices.
F. Visiting a construction site.
G. Watching movies of carpentry and related occupations.
H. Reading the Occupational Outlook Handbook.

LEVEL II EXPERIENCES

SECOND YEAR PROGRAM

CARPENTRY EXPERIENCE - - LEVEL II

Unit I

Title: Fabrication and Erection of Supporting Wood Structural Units in House Construction.

Objective: To develop in the individual the capability for erecting floor and ceiling framing joists and for framing a flat roof.

Manual or Manipulative Learning:

A. Laying out square and angle cuts with a framing square to an accuracy of 1/16 of an inch.
B. Checking the ends of joists for squareness with a framing square to an accuracy of 1/16 of an inch.
C. Cutting building material to length with a hand or power saw to an accuracy of 1/16 of an inch.
D. Drilling holes in wood with a hand or electric drill.
E. Fastening a sill plate to masonry by tightening nuts with an adjustable wrench.
F. Nailing framing members together with a hammer to an accuracy of 1/16 of an inch.
G. Erecting scaffolding in order to reach roof members.
H. Erecting corner posts with a level and hammer to an accuracy of 1/16 of an inch.

Verbal Learning:

Communication:

A. Reading a blueprint to determine the size and location of framing members.

B. Reading a blueprint to determine the method of fabrication.

Measurement:

A. Locating the center of a hole with a rule and square to an accuracy of 1/16 of an inch.

B. Measuring stock to length with a steel tape or folding rule to an accuracy of 1/16 of an inch.

C. Laying out locations for framing members with a folding rule or steel tape to an accuracy of 1/16 of an inch.

I. Removing bent nails with a bar or hammer.
J. Laying out framing members with "crowns" facing in one direction.
K. Beveling the top of floor joists for a tile floor with a hatchet or hand axe.
L. Marking the location of framing members with a folding ruler or steel tape and a framing square to an accuracy of 1/16 of an inch.
M. Installing furring or nailing strips on the sides of the floor joists being used to support a tile floor.

Mathematics:

A. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

General Information:

A. Explaining the reason for installing joists with the "crown" facing up.
B. Using an adjustable wrench properly.
C. Explaining various methods of sloping a flat roof.
D. Providing ventilation for enclosed foundation areas which are exposed to the earth.
E. Explaining the different methods of recessing a tile bathroom floor.
F. Using electric power tools safely.
G. Demonstrating safe use of step and extension ladders.
H. Explaining added precautions when using electric tools if operator is in contact with the ground.
I. Wearing the safety apparel appropriate to the job (glasses, shoes, helmets, gloves).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Constructing a box sill for a porch.
B. Erecting floor and ceiling joists.
C. Framing a flat roof.
D. Cutting stock to size with a hand or power saw to an accuracy of 1/16 of an inch.
E. Framing a bathroom floor in order to receive tile flooring.
F. Drawing up a list of materials for framing a bathroom floor by using instructions on a blueprint.
G. Laying out the location of framing members with a rule and square by following the dimensions given on a blueprint.
H. Cutting standard sizes of framing lumber so that waste is kept at a minimum.
I. Grounding an electric power tool so that protection is insured for the operator.
J. Sketching two methods of recessing the framing of a tile floor for a bathroom.

CARPENTRY EXPERIENCE - - LEVEL II

Unit II

Title: Fabrication and Erection of Partitions in House Construction.

Objective: To develop in the individual the capabilities of laying out stud spacing, assembling partitions and erecting wall sections.

Manual or Manipulative Learning:

A. Squaring members with a framing square to an accuracy of 1/16 of an inch.
B. Laying out stud locations with a framing square to an accuracy of 1/16 of an inch.
C. Laying out stock pieces on the floor according to a blueprint or plan.
D. Nailing members together with a hammer to an accuracy of 1/16 of an inch.
E. Raising partition to upright position from floor by hand.
F. Nailing wall sections to floor with a hammer to an accuracy of 1/16 of an inch.
G. Plumbing partition with a level to an accuracy of 1/16 of an inch.
H. Nailing on temporary diagonal bracing with a hammer for support.
I. Removing bent nails with a bar or hammer.

Verbal Learning:

Communication:

A. Reading a blueprint to determine location of framing members, sizes of openings and stud spacing.

Measurement:

A. Measuring stud spacing with a steel tape or folding ruler to an accuracy of 1/16 of an inch.

Mathematics:

A. Adding and subtracting whole numbers and fractions to determine stud placement for openings.

B. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

J. Laying out stud locations on sole and plate by laying each side by side and marking both at the same time.
K. Nailing gable studs in place with a hammer, placing them over wall studs.
L. Plumbing gable studs with a level when nailing them in place to an accuracy of 1/16 of an inch.

General Information

A. Recognizing the proper size nails to be used.
B. Demonstrating the various ways of framing a partition.
C. Wearing safety apparel appropriate to the job (glasses, shoes, helmets, gloves).
D. Explaining the two types of gable end studs.
E. Explaining the various methods of constructing corner posts.

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Laying out stud spacing with a ruler and framing square using a blueprint to determine proper location.
B. Assembling partitions with a hammer and nails.
C. Erecting partitions and plumbing them with a level to an accuracy of 1/16 of an inch.
D. Bracing partitions with diagonal members.
E. Assembling various types of corner posts.
F. Installing two types of gable studs.
G. Drawing sketches of the various methods of building up corner posts.

Unit III

Title: Application of Flooring and Roof Deck Materials in House Construction.

Objective: To develop in the individual the capability for applying flooring and roof deck materials.

Manual or Manipulative Learning:

A. Laying out square and diagonal cuts with a framing square to an accuracy of 1/16 of an inch.
B. Nailing building material in place with a hammer to an accuracy of 1/16 of an inch.
C. Removing bent nails with a hammer.
D. Staggering the joints of the roof decking and flooring in order to provide maximum strength and better appearance.
E. Driving flooring up tight with a hammer and a scrap piece of flooring.
F. Pulling flooring up tight with a pry-bar and a scrap piece of flooring.
G. Using a nail set to seat nails.

Verbal Learning:

Communication:

A. Reading a blueprint to determine size, type, location and method of applying building materials.

Measurement:

A. Measuring building materials to size with a folding ruler or steel tape to an accuracy of 1/16 of an inch.

B. Measuring the spaces between rafters with a folding rule to determine the size of fire stops to an accuracy of 1/16 of an inch.

Mathematics:

A. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

General Information

A. Recognizing the various thicknesses and widths of flooring.
B. Recognizing the face side of porch flooring.
C. Explaining the problems caused by hammer marks.
D. Demonstating the proper nailing pattern for plywood.
E. Explaining the various types of roof and porch decking.
F. Using electric power tools safely.
G. Demonstrating safe use of step and extension ladders.
H. Explaining added precautions when using electric tools if operator is in contact with the ground.
I. Wearing safety apparel appropriate to the job (glasses, shoes, helmets).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Installing fire stops between roof rafters.
B. Laying a porch floor.
C. Laying roof decking.
D. Cutting fire stops to an accuracy of 1/16 of an inch.
E. Identifying various sizes and types of flooring and roof decking.
F. Measuring openings where firestops are needed to an accuracy of 1/16 of an inch.

Unit IV

Title: Interior Installation Units in House Construction.

Objective: To develop in the individual the capability for fastening wood to masonry, installing furring and grounds, and assembling basement stairs.

Manual or Manipulative Learning:

A. Drilling holes in masonry for fasteners with an electric drill or a star drill.
B. Driving fasteners in masonry with an impact tool.
C. Attaching wood to masonry using a fastener and a screwdriver or adjustable wrench.
D. Sounding with a hammer to locate framing members.
E. Squaring cuts with a framing square to an accuracy of 1/16 of an inch.
F. Cutting building material to length with a hand or power saw to an accuracy of 1/16 of an inch.
G. Nailing furring strips, grounds, and stair parts in place with a hammer to an accuracy of 1/16 of an inch.
H. Removing bent nails with a bar or hammer.
I. Assembling the stairs on the floor and then lifting them into place.
J. Grinding a mushroomed head from a star drill.

Verbal Learning:

Communication:

A. Reading instructions for the installation of fasteners.
B. Reading a blueprint to determine the location and spacing of parts to be installed.

Measurement:

A. Measuring with a folding rule or steel tape to find the location of fasteners or furring strips to an accuracy of 1/16 of an inch.

Mathematics:

A. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

K. Demonstrating proper use of a screwdriver and an adjustable wrench.

General Information

A. Selecting the types of fasteners that best fit the requirements of the job.
B. Explaining the advantages and disadvantages of various available fasteners.
C. Using an adjustable wrench properly.
D. Explaining the method of installing each type of fastener.
E. Removing a mushroomed head from a star drill with a grinder.
F. Using a screwdriver safely.
G. Identifying the proper thickness of grounds to be used.
H. Using electric power tools safely.
I. Demonstrating safe use of step ladder.
J. Wearing the safety apparel appropriate to the job (glasses, shoes, helmets, gloves).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Drilling holes with an electric drill or with a star drill.
B. Installing one of each type of fastener available.
C. Locating points on a wall with a ruler and level after obtaining the necessary dimensions from a blueprint.
D. Demonstrating the proper method of grounding an electric drill.
E. Cutting furring strips for a job to an accuracy of 1/16 of an inch while keeping left over pieces to a minimum.
F. Drawing a sketch of a set of stairs showing the proper sequence of assembling treads and risers.
G. Assembling a set of stairs with a hammer.

H. Locating framing members hidden by dry wall or plaster.
I. Installing furring strips with a hammer to an accuracy of 1/8 of an inch.

CARPENTRY EXPERIENCE - - LEVEL II

Unit V

Title: Fabrication and Installation of Temporary Structures for Worker Safety During House Construction.

Objective: To develop in the individual the capability for fabricating and installing staging brackets, single and double post scaffolding, and foot rests for shingling a roof.

Manual or Manipulative Learning:

A. Laying out square and angle cuts with a framing square to an accuracy of 1/16 of an inch.
B. Cutting building material to size with a hand saw or power saw to an accuracy of 1/16 of an inch.
C. Attaching metal roof brackets to a roof with a hammer to an accuracy of 1/8 of an inch.
D. Anchoring a ladder to a roof by passing a rope over the peak and fastening it on the ground.
E. Anchoring a ladder on a roof with a brace which hooks over the peak of the roof.
F. Constructing a cleated board using a hammer, with a brace which hooks over the peak of the roof.
G. Removing bent nails with a hammer.
H. Placing a cross piece or foot rest across roof brackets.
I. Placing blocks under scaffold posts to prevent them from sinking into the ground.

Verbal Learning:

Communication:

A. Receiving verbal instructions regarding the type and size of scaffolding desired.

Measurement:

A. Measuring the size of building material and its location with a folding rule or steel tape to an accuracy of 1/16 of an inch.

Mathematics:

A. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

J. Plumbing scaffold posts with a level to an accuracy of 1/16 of an inch.
K. Securing the scaffolding to the building with braces.
L. Attaching toe boards with a hammer.
M. Laying planks across ledges and nailing them in place.
N. Attaching a hand rail with a hammer.
O. Sharpening stakes with a saw or axe.
P. Driving stakes with a sledge hammer.
Q. Attaching braces from stakes to scaffold with a hammer.
R. Drilling holes in wood with a hand or power drill to an accuracy of 1/8 of an inch.
S. Leveling between staging brackets with a level and straight edge to an accuracy of 1/8 of an inch.
T. Securing staging brackets to the building with lag screws, bolts and wing nuts, or nails to an accuracy of 1/8 of an inch.

B. Explaining the strength gained by the use of diagonal braces and triangular structures.

General Information

A. Explaining the various methods of attaching the brackets to a house.
B. Using an adjustable wrench properly.
C. Checking lumber for defects prior to using it on scaffolding.
D. Explaining the different types of scaffolding.
E. Explaining that the scaffolding must support the worker plus the building materials he is using.
F. Wearing a soft soled shoe when working on a roof for the purpose of safety and to protect the roof.
G. Explaining the different methods of constructing a foot rest.
H. Using electric power tools safely.
I. Demonstrating safe use of step and extension ladders.
J. Explaining added precautions when using electric tools if operator is in contact with the ground.
K. Wearing the safety apparel appropriate to the job (glasses, shoes, helmets, gloves).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Installing staging brackets on a house.
B. Drawing a sketch showing the construction of a single pole scaffold with the necessary braces.
C. Building a single pole scaffold to a height of six feet.
D. Building a foot rest which could be used when shingling a roof.
E. Making a sketch showing the distribution of forces on a structure which is supported by diagonal braces.

Unit VI

Title: Application of Roofing Materials in House Construction.

Objective: To develop in the individual the capability for installing or applying a metal drip edge, roll roofing, sheet metal roofing and built-up roofing.

Manual or Manipulative Learning:

A. Laying out square and angular cuts with a framing square to an accuracy of 1/16 of an inch.
B. Cutting sheet metal with a fine tooth hack saw or a pair of shears to an accuracy of 1/16 of an inch.
C. Nailing building material in place with a hammer to an accuracy of an inch.
D. Removing bent nails with a bar or hammer.
E. Fitting the end of one piece of drip edge to another.
F. Fastening tin covering over knot holes.
G. Rolling out roofing paper to expose it to the sun before installation.
H. Cutting roofing paper to size with a knife.
I. Cementing joints in roofing with brush and tar.
J. Staggering the joints in roofing for best installation.

Verbal Learning:

Communication:

A. Reading manufacturer's instructions for installation.

B. Reading a blueprint to determine the lap required, the number of plies, and the type of nails to be used.

Measurement:

A. Measuring building material with a folding ruler or steel tape to an accuracy of 1/16 of an inch.

Mathematics:

A. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

B. Calculating the area to be covered with roofing material.

K. Lapping the joints on sheet metal roofing.
L. Nailing sheet metal roofing in place with lead headed nails.
M. Mopping built-up roofing with asphalt using a brush.
N. Covering the last ply of built-up roofing with roof slag using a shovel and rake.
O. Cleaning and storing the asphalt brush following use.

General Information

A. Driving nails for the drip edge into framing members so they will not show.
B. Explaining the reason for installing drip edge over the building paper.
C. Explaining the coverage of roofing materials and the standard sizes in which roofing is supplied.
D. Explaining the recommended lap joint on the end and edge of roofing.
E. Explaining the difference in the vertical and horizontal application of courses.
F. Explaining the importance of driving nails straight when applying roll roofing.
G. Explaining the importance of protecting roll roofing with the proper foot wear.
H. Practicing safety precautions with hot asphalt.
I. Handling sheet metal with care in windy weather.
J. Keeping the roofing dry in the work area.
K. Keeping the work area on the roof clear of obstruction.
L. Demonstrating safe use of step and extension ladders.
M. Wearing the safety apparel appropriate to the job (glasses, shoes, helmets, gloves).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Drawing a sketch showing the lap and nailing pattern for roll roofing and sheet metal roofing.
B. Figuring the area of selected problem situations.
C. Applying roll roofing to a roof.
D. Cutting metal roofing and drip edge to size with a hack saw or metal shears.
E. Applying a metal drip edge to a roof.
F. Applying sheet metal roofing to a roof.
G. Applying built-up roofing to a roof.

CARPENTRY EXPERIENCE - - LEVEL II

Unit VII

Title: Exterior Finishing Operations in House Construction.

Objective: To develop in the individual the capability for applying building paper, cutting material to length, installing corner boards and hanging a gutter.

Manual or Manipulative Learning:

A. Laying out square and angular cuts with a framing square to an accuracy of 1/16 of an inch.
B. Cutting building material to size with a hand or power saw to an accuracy of 1/16 of an inch.
C. Nailing building material together with a hammer to an accuracy of 1/16 of an inch.
D. Removing bent nails with a hammer.
E. Placing corner boards in position to determine the shape of the top end.
F. Nailing hangers for a gutter under the shingles with a hammer to an accuracy of 1/16 of an inch.
G. Nailing a gutter into place with a hammer to an accuracy of 1/16 of an inch.
H. Fastening a gutter in place with hooks.

Verbal Learning:

Communication:

A. Reading a blueprint to determine the size and type of material as well as the method of fastening it in place.
B. Reading a blueprint to determine the direction of water flow in a gutter and the location of the downspouts.
C. Reading the manufacturer's instructions for installation of gutters and fittings.

Measurement:

A. Measuring building material to size with a folding ruler or steel tape to an accuracy of 1/16 of an inch.

Mathematics:

A. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

I. Fastening downspout brackets to the siding of a house with a screwdriver to an accuracy of 1/8 of an inch.
J. Constructing a fixture for cutting multiple pieces the same size to an accuracy of 1/16 of an inch.
K. Cutting building paper to length with a knife to an accuracy of one inch.
L. Unrolling building paper in place on the surface to whicn it will be applied.
M. Fastening building paper in place with a stapling hammer.
N. Eliminating large wrinkles in building paper by cutting them and restapling them.

B. Adding or subtracting from dimensions on a drawing to determine the length of building materials required for the job.

General Information

A. Using a screwdriver safely.
B. Identifying various types of building materials.
C. Measuring the total length in one step rather than in multiples of shorter measurements.
D. Explaining the purpose of using building paper (waterproofing, reduce infiltration of air and dust, provide noise suppression).
E. Explaining the types of building paper available (tarred felt, paraffin saturated, laminated, Kraft and foil).
F. Demonstrating safe use of step and extension ladders.
G. Explaining added precautions when using electric tools if operator is in contact with the ground.
H. Wearing the safety apparel appropriate to the job (glasses, shoes, helmets, gloves).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Applying building paper to a roof deck.
B. Identifying various types of building paper.
C. Drawing up a list of materials including size and type from a blueprint.
D. Planning the cutting up of stock sizes of lumber so that waste is kept to a minimum.
E. Measuring building material with a ruler to an accuracy of 1/16 of an inch.
F. Installing gutter hangers on a roof.
G. Nailing a gutter in place or fastening it to the hangers.
H. Installing downspouts for gutters.
I. Cutting a gutter to size with a hacksaw or metal shears to an accuracy of 1/16 of an inch.
J. Demonstrating safe use of an extension ladder.
K. Installing corner boards on a house.
L. Cutting building material to size with a hand saw or power saw to an accuracy of 1/16 of an inch.

CARPENTRY EXPERIENCES - - LEVEL II

Unit VIII

Title: Occupational Information Pertaining to Carpentry and Related Occupations.

Objective: To acquaint the individual with the opportunities in carpentry and related occupations.

Occupational Information

Obtaining information about:

A. The employment outlook.
B. The wage scale.
C. The types of training available.
D. The working conditions experienced in the occupation.
E. The physical and mental characteristics needed for qualification for employment.
F. The geographical location of employment.
G. The opportunities for advancement.
H. The advantages and disadvantages of the occupation.
I. The nature of the work involved in the occupation.
J. The union involvement in the occupation.
K. The means of entry into the occupation.

Suggested Student Activities

A. Writing specific information concerning opportunities in carpentry and related occupations.
B. Visiting an office of the State Employment Service.
C. Listening to a speaker from a trade union.
D. Writing letters to correspondence and trade schools in order to determine opportunities for additional training.
E. Visiting a school for apprentices.
F. Visiting a construction site.
G. Watching movies of carpentry and related occupations.
H. Reading the Occupational Outlook Handbook.

INSTRUCTIONAL MATERIALS FOR CARPENTRY

TYPE	TITLE	DESCRIPTION	SOURCE
Book	Fundamentals of Carpentry, Vol I. by Walter E. Durbahn	The text covers fundamentals of tools, materials and practices in carpentry	American Technical Society
Book	Fundamentals of Carpentry, Vol. II by Walter E. Durbahn and Elmer W. Sundberg	The text covers basic knowledge for carpentry	American Technical Society
Book	The Building Trades Handbook by International Correspondence Schools	The text includes mathematics, geometrical drawing, structural design, concrete, stonework, carpentry, etc.	International Textbook Company
Book	Carpentry for the Building Trades by E.A. Lair	The text covers essentials of practical carpentry for small and medium-sized frame houses.	McGraw-Hill Book Co.
Book	Practical Carpentry by Floyd M. Mix (ed.)	A cyclopedia of information on modern building methods	Goodheart-Willcox Co., Inc.
Book	Practical House Carpentry by Douglas J. Wilson	The text covers fundamentals and methods of house building	McGraw-Hill Book Co.
Film	Builders, The; No. 370	The film covers a story of architecture and construction and various kinds of new building material. 31 min.	Modern Talking Picture Service

Film	Building a House	Film shows the constuction of a low-cost wood framed one-family home. 10 min.	Arizona State University Encyclopedia Britannica Films
Film	Insulation	Film shows various types of insulation and the installation of each	U.S. Gypsum
Film	The Outside Story	Film shows various roofing and siding products, types and installation. 16mm.	U.S. Gypsum
Film Strip	Woodworking Tools and Machines	Strip shows the use of planes, bits, knives, chisels, screwdrivers, etc. 72 min.	Jam Handy
Chart	Stanley Instruction Charts	Charts shows Stanley tools	Stanley Tools
Pamphlet	Matematics for Carpentry	Pamphlet shows basic knowledge and fundamental skills	United Brotherhood of Carpenters & Joiners of America
Pamphlet	Manipulative Instructional Units for Roof Framing	Pamphlet covers basic roof framing and roof coverings	United Brotherhood of Carpenters & Joiners of America
Pamphlet	Manipulative Instructional Units for Foundations	Pamphlet covers basic principles and typical methods for small houses	United Brotherhood of Carpenters & Joiners of America
Pamphlet	Manipulative Instructional Units for Rough Framing	Pamphlet covers framing and masonery construction	United Brotherhood of Carpenters & Joiners

LEVEL I EXPERIENCES

FIRST YEAR PROGRAM

ELECTRICAL EXPERIENCES - - LEVEL I

Unit I

Title: Supporting Operations for Electrical and Related Occupations in Home Construction.

Objective: To develop in the individual the capability for erecting a temporary service pole, installing conduit and entrance cable.

Manual or Manipulative Learning:

A. Digging a hole with a bar and shovel.
B. Erecting the service pole in the hole.
C. Filling the hole surrounding the pole with earth using a shovel and tamping the earth with a bar.
D. Cutting building material to size with a hand or power saw to an accuracy of 1/8 of an inch.
E. Sharpening stakes with an axe.
F. Driving stakes with a sledge hammer.
G. Installing braces from the stakes to the pole for support.
H. Erecting a board with a waterproof cover on the pole to protect the meter.
I. Drilling holes with an electric drill.
J. Holding conduit in a vise.
K. Using cutting oil for cutting and threading conduit.

Verbal Learning:

Communication:

A. Reading a blueprint to determine the proper location and required size of the electrical installation.
B. Reading the "code" to determine the proper method of installation.

Measurement:

A. Measuring the size and location of electrical equipment to an accuracy of 1/16 of an inch.

Mathematics:

A. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

Science:

A. Explaining the importance of grounding electric tools.

L. Cutting conduit to length with a pipe cutter or hack saw to an accuracy of 1/16 of an inch.
M. Cutting conduit square for proper joints.
N. Reaming the conduit with a reamer.
O. Threading conduit with a die by hand or machine.
P. Cutting conduit thread the proper length.
Q. Changing the die sizes of hand and power thread cutters.
R. Bending conduit with a hickey or improvised device.
S. Installing factory bent elbows with a wrench.
T. Installling pressure and threaded couplings with a wrench.
U. Installing conduit and fittings with a pipe wrench.
V. Removing knockout plugs with a screwdriver.
W. Removing knockout plugs only when necessary.
X. Connecting conduit to boxes with a wrench.
Y. Leveling and plumbing exposed conduit with a level.
Z. Installing straps on conduit with a screwdriver.
AA. Locating framing members of a house by observation or sounding.
AB. Attaching the service entrance head to the house with a screwdriver.
AC. Removing the outer sheathing from the end of the cable with a knife.

AD. Installing the entrance cable in the entrance head with a screwdriver.
AE. Plumbing and leveling the entrance cable with a level where possible.
AF. Fastening the cable to the side of the house with cable clamps, electric drill and screwdriver.
AG. Bending the cable carefully to make a neat installation.
AH. Cutting the cable with a hacksaw.

General Information

A. Explaining the importance of the "code."
B. Explaining the purpose of having a smooth interior in conduit.
C. Cleaning, cutting, reaming, and threading tools with a cloth following use.
D. Using an adjustable wrench properly.
E. Protecting cable from damage by overbending it.
F. Explaining the importance of appearance of the job.
G. Demonstrating safe use of step and extension ladders.
H. Using electric power tools safely.
I. Using a screwdriver safely.
J. Explaining added precautions when using electric tools if operator is in contact with the ground.
K. Wearing the safety apparel appropriate to the job (glasses, shoes, helmets, gloves).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Erecting a temporary service pole.
B. Installing conduit in a house.
C. Cutting, threading and reaming conduit.
D. Drawing up a table showing the capacity of various sizes of conduits.
E. Installing entrance cable on the exterior of a building.
F. Demonstrating safe use of a screwdriver to the class.
G. Listing the basic regulations concerned with the installation of conduit.

ELECTRICAL EXPERIENCES - - LEVEL I

Unit II

Title: Introductory Work to Circuitry in Electrical and Related Occupations in House Construction.

Objective: To develop in the individual the capability for installing boxes, wiring, receptacles, switches, conduit, entrance cable and a temporary service pole.

Manual or Manipulative Learning:

A. Laying out square and angular lines on building material with a framing square to an accuracy of 1/16 of an inch.
B. Cutting building material with a hand or power saw to an accuracy of 1/16 of an inch.
C. Installing boxes with a hammer or screwdriver at proper locations on the framing members, allowing for the proper projection for various sheathing materials, to an accuracy of 1/16 of an inch.
D. Nailing building material in place with a hammer to an accuracy of 1/16 of an inch.
E. Installing boxes between framing members with a screwdriver, with the proper projection for various sheathing materials, to an accuracy of 1/16 of an inch.

Verbal Learning:

Communication:

A. Reading a blueprint to determine the location of boxes, switches, receptacles, fixtures, pilot lights and the size of the wire required.
B. Reading the "code" to determine the: regulations concerning the size and placement of boxes, size of wire required, and acceptable practice for installation of switches, etc.

Measurement:

A. Measuring with a ruler to locate electrical boxes to an accuracy of 1/16 of an inch.
B. Measuring the length of running boards with a ruler to an accuracy of 1/8 of an inch.

F. Joining boxes together with a screwdriver for multiple outlets.
G. Locating the center of the ceiling of a room with a chalk line.
H. Installing boxes on a masonry wall with an electric drill and screwdriver to an accuracy of 1/16 of an inch.
I. Installing boxes on masonry with an impact tool.
J. Removing knock-out plugs only when necessary.
K. Cutting wire with side cutting pliers.
L. Drilling holes in building material with an electric drill.
M. Installing running boards on framing members, with a hammer, for running wire.
N. Removing bent nails with a hammer.
O. Running wire from box to box.
P. Fastening the wire to framing members and running boards with staples and a hammer.
Q. Removing protective sheathing with a cable stripper.
R. Fastening wire to the box with cable connectors and a screwdriver.
S. Installing wire in conduit with a fish tape.
T. Removing inner insulation from the wire with a knife.
U. Fastening the wire under the terminal screws with a screwdriver.
V. Fastening the ground wire to the receptacle, box or connector with a screwdriver.

Science:

A. Explaining the purpose of grounding portable electric tools.
B. Protecting L.P. soldering equipment from oil.
C. Explaining the need for fluxing action.

W. Installing receptacles or switches in outlet boxes in a plumb or level position with a screwdriver.
X. Installing switch or receptacle plates with a screwdriver.
Y. Splicing wires with a pigtail splice using side cutters.
Z. Splicing wires with a wire nut.

AA. Scraping wires with a knife prior to soldering.
AB. Soldering a splice with a flame or electric soldering gun.
AC. Insulating a splice with electrical tape.
AD. Hanging fixtures from a box with 1/8" pipe.
AE. Connecting fixtures to a box by means of a strap.

General Information

A. Explaining the importance of the "code".
B. Using electric power tools safely.
C. Using a screwdriver safely.
D. Demonstrating safe use of step ladder.
E. Explaining the methods of installing fasteners in masonry.
F. Explaining added precautions when using electric tools if operator is in contact with the ground.
G. Protecting the cable insulation from damage by bending or kinking.
H. Running wire from box to box with no splices in between boxes.
I. Protecting cable from nails used in construction.
J. Cleaning up any dirt in the area where work is finished.
K. Using various sorts of heat for soldering.
L. Using and storing L.P. soldering equipment with care.
M. Using safety precautions around hot materials.
N. Wearing the safety apparel appropriate to the job (glasses, shoes, gloves).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Connecting receptacles, single throw switches, fixtures, and pilot lights to complete a circuit.
B. Draw up a table of commonly used drawing symbols in electricity.
C. Demonstrating proper use of various soldering devices.
D. Installing wire from box to box.
E. Drawing up a table based on the "code" showing the gauge of wire required for various installations.
F. Installing boxes for receptacles, switches, junctions and fixtures in a house.

ELECTRICAL EXPERIENCES - - LEVEL I

Unit III

Title: Occupational Information Pertaining to Electrical and Related Occupations.

Objective: To acquaint the individual with the opportunities in electrical and related occupations.

Occupational Information

Obtaining information about:

A. The employment outlook.
B. The wage scale.
C. The types of training available.
D. The working conditions experienced in the occupation.
E. The physical and mental characteristics needed for qualification for employment.
F. The geographical location of employment.
G. The opportunities for advancement.
H. The advantages and disadvantages of the occupation.
I. The nature of the work involved in the occupation.
J. The union involvement in the occupation.
K. The means of entry into the occupation.

Suggested Student Activities

A. Writing specific information concerning opportunities in electrical and related occupations.
B. Visiting an office of the State Employment Service.
C. Listening to a speaker from a trade union.
D. Writing letters to correspondence and trade schools in order to determine opportunities for additional training.
E. Visiting a school for apprentices.
F. Visiting a construction site.
G. Watching movies of electrical and related occupations.
H. Reading the Occupational Outlook Handbook.

LEVEL II EXPERIENCES

SECOND YEAR PROGRAM

ELECTRICAL EXPERIENCES - - LEVEL II

Unit I

Title: Elementary Circuitry in Electrical and Related Occupations in House Construction.

Objective: To develop in the individual the capability for installing an electric range, grounds, doorbells, hot water heaters, water pumps and attic fans.

Manual or Manipulative Learning:

A. Drilling holes with an electric drill for the installation of the cable.
B. Squaring the running boards with a framing square to an accuracy of 1/8 of an inch.
C. Cutting running boards to size with a hand or power saw to an accuracy of 1/8 of an inch.
D. Installing running boards with a hammer for the mounting of cable.
E. Removing bent nails with a hammer.
F. Installing the cable from fuse panel to outlet leaving sufficient amount for the connections.
G. Cutting cable with side cutters or a hack saw.
H. Fastening the cable in place with a hammer or screwdriver.
I. Removing the outer sheathing from the cable with a knife or cable stripper.

Verbal Learning:

Communication:

A. Reading the "code" to determine the required installation.
B. Reading a blueprint to determine the proper location of the installation.
C. Reading the manufacturer's directions for proper installation.

Measurement:

A. Measuring to locate a switch or appliance to an accuracy of 1/16 of an inch.
B. Measuring the size of running boards to an accuracy of 1/8 of an inch.

Science:

A. Explaining the problem of electrolysis when two unlike metals touch each other.

J. Removing knockout plugs with a screwdriver.
K. Removing knockout plugs only when necessary.
L. Connecting the cable to the outlet box with a connector and screwdriver.
M. Removing inner insulation from the wire with a knife.
N. Connecting the cable to the terminals with a screwdriver.
O. Fastening the range outlet in place with a screwdriver.
P. Attaching ground clamps to the cold water pipe at the proper location with a screwdriver.
Q. Driving an "artificial ground" or "made electrode" with a sledge hammer for the installation of a ground in rural areas.
R. Installing bell or buzzer and switch in place with a screwdriver to an accuracy of 1/16 of an inch.
S. Installing the housing on a bell or buzzer with a screwdriver.
T. Connecting the transformer to the signalling circuit with a screwdriver.
U. Installing a disconnect switch with a screwdriver if the circuit is not protected by a circuit breaker.
V. Installing wire from the disconnect switch to the appliance and from the fuse panel to the disconnect switch.
W. Connecting the ground wire to the box or cable clamp with a screwdriver.

B. Explaining the importance of ground-electric tools.

X. Splicing wires with a pigtail splice using side cutters.
Y. Splicing wires with a wire nut.
Z. Soldering a splice with a flame or soldering gun.
AA. Insulating the splice with electrical tape.
AB. Installing fuses in the disconnect switch.
AC. Installing a switch box with a hammer and screwdriver at the proper location with an extension from the framing to allow for interior sheathing to an accuracy of 1/16 of an inch.

General Information

A. Explaining the importance of the "code".
B. Protecting the cable from overbending which would damage the insulation.
C. Explaining the importance of using a ground clamp made of the proper material.
D. Cleaning up after the completion of the work in any area that has already been finished.
E. Using various sorts of heat for soldering.
F. Using and storing L.P. soldering equipment with care.
G. Using safety precautions around hot materials.
H. Using electric power tools safely.
I. Using a screwdriver safely.
J. Demonstrating safe use of step ladder.
K. Explaining added precautions when using electric tools if operator is in contact with the ground.
L. Wearing the safety apparel appropriate to the job (gloves, glasses, helmets).

Suggested Student Activities:

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Installing a separate circuit for an electric range.
B. Drawing up a table showing frequently used electrical symbols.
C. Installing grounds to meet code requirements for a house.
D. Installing low voltage operated bells.
E. Connecting a hot water heater to a power source.
F. Drawing a schematic diagram of a circuit for a hot water heater.
G. Installing a disconnect switch on a masonry wall.
H. Splicing, soldering and insulating wires.
I. Connecting a water pump to a power source.
J. Drawing a diagram showing the function of a ground wire on portable electrical equipment.
K. Installing an attic fan in a building.
L. Constructing a display board to show the maximum amount of bend that can be put in various size cables.

ELECTRICAL EXPERIENCES - - LEVEL II

Unit II

Title: Occupational Information Pertaining to Electrical and Related Occupations.

Objective: To acquaint the individual with the opportunities in electrical and related occupations.

Occupational Information

Obtaining information about:

A. The employment outlook.
B. The wage scale.
C. The types of training available.
D. The working conditions experienced in the occupation.
E. The physical and mental characteristics needed for qualification for employment.
F. The geographical location of employment.
G. The opportunities for advancement.
H. The advantages and disadvantages of the occupation.
I. The nature of the work involved in the occupation.
J. The union involvement in the occupation.
K. The means of entry into the occupation.

Suggested Student Activities

A. Writing specific information concerning opportunities in electrical and related occupations.
B. Visiting an office of the State Employment Service.
C. Listening to a speaker from a trade union.
D. Writing letters to correspondence and trade schools in order to determine opportunities for additional training.
E. Visiting a school for apprentices.
F. Visiting a construction site.
G. Watching movies of electrical and related occupations.
H. Reading the Occupational Outlook Handbook.

INSTRUCTIONAL MATERIALS FOR ELECTRICITY

TYPE	TITLE	DESCRIPTION	SOURCE
Book	Adequate Wiring for Home and Farm by E.W. Jones and J.L. Johnston	The text covers simple rules and principles in home wiring	Bruce Publishing Co.
Book	Practical Electrical Wiring by H.P. Richter	The text covers basic principles, apparatus and applications of electricity in homes and industry	McGraw-Hill Book Co.
Book	National Electrical Code Handbook by Abbot and Setka	The text includes wiring codes for different class installations.	McGraw-Hill Book Co.
Book	National Electrical Code by National Board of Fire Underwriters	The book includes concise definitions of building requirements	National Board of Fire Underwriters
Book	Basic Electricity by George Burkert	The text covers tools used in the trade	N.J. Department of Vocational Education
Film	Current Flow, What is It	Film covers electron flow	United World Films, Inc.
Film	The Electrician	Film discusses home wiring, generation and machinery. 11 min.	Carl F. Mahnke Productions
Film	Keep 'Em Protected	Film shows how circuit breakers are used	Westinghouse

LEVEL I EXPERIENCES

FIRST YEAR PROGRAM

MASONRY EXPERIENCES - - LEVEL I

Unit I

Title: Introductory Trowel Skills in House Construction.

Objective: To develop in the individual the capability for installing anchor bolts in masonry and pointing up a brick wall.

Manual or Manipulative Learning:

A. Blocking off cells in concrete block walls with paper at a depth so the head of the bolt will be surrounded by cement.
B. Filling the cavity with stiff cement using a trowel.
C. Placing the bolt in cement allowing for the proper exposure.
D. Puddling cement around the bolt head with a small trowel to insure that it will not turn when the cement is hard.
E. Checking the bolt for plumb and proper exposure with a square and rule.
F. Protecting bolts from accidental movement while drying.
G. Finishing a wall with a concave or V-shaped joint using a trowel.
H. Finishing a wall with a weathered joint using a trowel.
I. Finishing a wall with a rough cut or flush joint using a trowel.

Verbal Learning:

Communication:

A. Reading a blueprint to determine the size, location, and exposure of the bolts.
B. Reading a blueprint to determine the type of pointing required.

Measurement:

A. Measuring a wall or slab with a ruler to find the location of bolts to an accuracy of 1/16 of an inch.

General Information

A. Explaining the importance of not leaving an air cavity around the bolt head.
B. Knowing the advantages and disadvantages of the various pointing-up techniques.
C. Demonstrating safe use of step and extension ladders.
D. Wearing the safety apparel appropriate to the job (glasses).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Making a sectional drawing of each type of pointing-up procedure.
B. Making a sketch of the location of the bolts after reading a blueprint.
C. Pointing up sections of a brick wall using each of the techniques.
D. Embedding bolts in concrete following the specifications for the job.
E. Smoothing of the concrete around the bolt with a trowel.

MASONRY EXPERIENCES - - LEVEL I

Unit II

Title: Processes For Forming Concrete in House Construction.

Objective: To develop in the individual the capability for caring for forms, and pouring cement in forms.

Manual or Manipulative Learning:

A. Removing all nails used in assembling forms with a hammer or bar.
B. Hammering forms with a rubber mallet to loosen cement.
C. Scraping forms with a hoe to remove cement.
D. Brushing loose cement off forms with a wire brush.
E. Applying oil with a brush to the form surfaces in contact with the cement.
F. Removing any debris from the cavity to be poured.
G. Wetting the form and surrounding earth before pouring the concrete.
H. Placing the concrete in the form where it is needed.
I. Pulling the reinforcing mesh up into the concrete.
J. Puddling or vibrating the concrete with a hoe or mechanical vibrator.

Verbal Learning:

Science:

A. Explaining the importance of grounding electric tools.
B. Explaining the pressure developed by concrete when poured in place.

K. Leveling the top of the concrete with a screed.
L. Checking the top of the concrete for low spots.
M. Cleaning the tools following use with water and a wire brush.

General Information

A. Protecting the form surface from damage when handling the forms.
B. Lifting heavy material safely.
C. Explaining the purpose of vibrating the concrete mix.
D. Explaining why concrete should be "placed" rather than pushed or pulled from one place to another.
E. Explaining why concrete should not be overworked when plastic.
F. Explaining added precautions when using electric tools if operator is in contact with the ground.
G. Wearing the safety apparel appropriate to the job (glasses, shoes, helmets, gloves).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Weighing one cubic foot of concrete.
B. Figuring the pressure at the bottom of a form three feet high.
C. Pouring two blocks of cement, one that is not puddled and one that is puddled and observing the characteristics of each block after they have hardened.
D. Cleaning cement forms following use.
E. Leveling the top of poured concrete with a screed.
F. Cleaning tools with water and a wire brush.

MASONRY EXPERIENCES - - LEVEL I

Unit III

Title: Waterproofing Procedures on Masonry Surfaces in House Construction.

Objective: To develop in the individual the capability for waterproofing masonry surfaces above and below grade.

Manual or Manipulative Learning:

A. Cleaning the area to be covered with a cold chisel, hammer, hoe, and a stiff broom.
B. Opening the can of waterproofing with a hammer, pry-bar or paint can opener.
C. Heating asphalt coating prior to use in cold weather.
D. Applying asphalt coating to the foundation with a brush being sure to cover the joint between the wall and the footing.
E. Applying clear waterproofing above grade with a brush.
F. Resealing a can of waterproofing with a hammer.
G. Cleaning the applicator for clean finishes following use.
H. Protecting the coated area from traffic.

Verbal Learning:

Communication:

A. Reading the manufacturer's instructions for application of waterproofing.
B. Reading a blueprint to determine the height of application on the foundation and the number of coats required.

Measurement:

A. Measuring the area to be coated with a folding ruler or a steel tape to an accuracy of one inch.
B. Measuring liquids in pints, quarts and gallons.

Mathematics:

A. Multiplying to compute area.
B. Dividing in order to fine the volume necessary for the area to be covered.

Science:

A. Protecting combustable material when heating it.

General Information

A. Planning the work schedule in order to work in the sun when applying asphalt waterproofing.
B. Applying asphalt coating in an orderly manner to insure personal cleanliness.
C. Examining cement surfaces to be sure the pores have been sealed with asphalt.
D. Removing a mushroomed head from a cold chisel with a grinder.
E. Demonstrating safe use of step and extension ladders.
F. Wearing the safety apparel appropriate to the job (glasses, helmets, gloves).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Drawing a table showing the breakdown of a gallon into quantities as small as half a pint.
B. Removing a mushroomed head from a cold chisel with a grinder.
C. Demonstrating safe practices in the use of a stepladder.
D. Cleaning a foundation with a cold chisel, hammer, hoe, and a stiff broom.
E. Computing areas of problem situations given to the student.
F. Applying asphalt coating to concrete in order to waterproof it.
G. Testing the effectiveness of multiple coats of waterproofing in preventing the passage of moisture into concrete.

MASONRY EXPERIENCES - - LEVEL I

Unit IV

__Title__: Supporting Activities for Masonry Operations in House Construction.

__Objective__: To develop in the individual the capability for setting up a work area for mixing concrete on the job, mixing concrete, shoring sidewalls of ditches, protecting a concrete slab following finishing operations, erecting scaffolding and cleaning out mortar joints.

__Manual or Manipulative Learning__:

A. Removing cement or mortar with hammer and chisel to a depth of one inch.
B. Removing cement or mortar with a pneumatic chisel to a depth of one inch.
C. Cleaning out the chips and dust with water or air.
D. Erecting a low scaffold with concrete block and plank.
E. Laying cut square and angular cuts with a framing square to an accuracy of 1/8 of an inch.
F. Cutting lumber with a hand or power saw to an accuracy of 1/8 of an inch.
G. Fastening building material with a hammer and nails to an accuracy of 1/8 of an inch.

__Verbal Learning__:

__Communication__:

A. Reading a blueprint to determine the type of scaffolding specified.
B. Receiving and interpreting vocal instructions from the mason or plasterer.
C. Reading a blueprint to determine mix proportions.
D. Reading a blueprint to determine the recommended protection.

__Measurement__:

A. Measuring the size of building material with a folding ruler or a steel tape to an accuracy of 1/8 of an inch.

H. Bracing scaffolding securely with cross members.
I. Sharpening stakes with an axe or saw.
J. Driving stakes with a sledge hammer.
K. Bracing scaffolding from stakes.
L. Protecting the bottom of a scaffold pole from sinking into the ground with a flat stone or board.
M. Leveling the members to hold the walkway with a level and straight edge.
N. Removing bent nails with a bar or hammer.
O. Covering the concrete with straw, canvas or polyethylene to slow down drying or to provide protection from freezing.
P. Checking the temperature of concrete with a thermometer to determine if it is safe from freezing.
Q. Constructing sun shades and wind breaks with a hammer to prevent rapid drying.
R. Starting and shutting-off fuel burning heaters such as salamanders.
S. Sprinkling concrete with water from a hose to reduce evaporation of moisture from the concrete.
T. Positioning supplies for ease in shoveling them into the mixer.
U. Leveling the mixer and water barrel with a level.
V. Constructing a container with a hammer for cement so it does not have to be shoveled from the bag.
W. Protecting the lead cord from water near the mixer.

Mathematics:

A. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.
B. Halving, doubling, tripling, etc., the proportions to suit the size of the mix desired.

X. Checking the mixer for proper oil level.
Y. Providing gasoline and lubricant for the mixer.
Z. Measuring proper amount of ingredients with a shovel.
AA. Inserting ingredients into the mixer or mortar box in proper order with a shovel.
AB. Mixing ingredients dry with a hoe or a machine.
AC. Adding the proper amount of water to the mix with a pail.
AD. Performing a slump test to meet the specifications of the job.
AE. Cleaning up the mixer following use with stone, water and a wire brush.
AF. Cleaning up the tools following use with water and a wire brush.

General Information

A. Explaining the need for temperature and humidity control while concrete is curing.
B. Protecting oneself and the premises when handling fuel and fuel burning heaters.
C. Explaining the venting that is necessary for safety when using fuel burning heaters in an enclosed area.
D. Explaining the advantage of using a separate shovel for dry cement when mixing concrete on the job.
E. Explaining the need for adjusting the amount of water when the sand and stone are wet.
F. Explaining the necessity of measuring the ingredients accurately.
G. Explaining the safety measures necessary when working around power equipment.
H. Explaining the safety precautions for the worker when working near unstable earth.
I. Demonstrating methods of bracing to provide security against cave-ins.

J. Using a dust mask when cleaning out mortar joints.
K. Explaining the safety precautions necessary when using a pneumatic chisel.
L. Removing all loose mortar, even beyond a depth of one inch when necessary.
M. Removing the mushroomed head from a cold chisel with a grinder.
N. Explaining the safe practices in using a power saw.
O. Understanding that the scaffold must support the worker plus the materials he is using.
P. Checking lumber for defects and knots prior to using it in scaffolding.
Q. Explaining the method of attaching a scaffold to a building.
R. Demonstrating safe use of a step ladder and an extension ladder.
S. Explaining the added precautions when using electric tools if the operator is in contact with the ground.
T. Using electric power tools safely.
U. Wearing the appropriate safety apparel for the job (glasses, shoes, helmets, gloves).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Construct a sun shield or wind break to protect a concrete slab.
B. Start and shut-off a salamander.
C. Building a box to hold dry cement when mixing concrete.
D. Mixing concrete and mortar by machine and by hand.
E. Cleaning up tools following use with concrete.
F. Cleaning up a mixer and mortar box following use.
G. Drawing up a table showing quantities of materials needed for various mixes and quantities.
H. Shoring the sidewall of a ditch to prevent it from caving in.
I. Cutting wood to size with a hand saw or power saw to an accuracy of 1/8 of an inch.
J. Sharpening stakes with a saw or axe and driving them with a sledge hammer.

K. Cutting up material so that waste is kept to a minimum.
L. Cleaning out mortar joints with a hammer and chisel.
M. Cleaning out mortar joints with a pneumatic chisel.
N. Erecting a low scaffold with concrete blocks for a mason.
O. Erecting a wooden scaffold for a mason.
P. Selecting lumber that is not suitable for a scaffold.
Q. Demonstrating safe use of a power saw.

Unit V

Title: Occupational Information Pertaining to Masonry and Related Occupations.

Objective: To acquaint the individual with the opportunities in masonry and related occupations.

Occupational Information

Obtaining information about:

A. The employment outlook.
B. The wage scale.
C. The types of training available.
D. The working conditions experienced in the occupation.
E. The physical and mental characteristics needed for qualification for employment.
F. The geographical location of employment.
G. The opportunities for advancement.
H. The advantages and disadvantages of the occupation.
I. The nature of the work involved in the occupation.
J. The union involvement in the occupation.
K. The means of entry into the occupation.

Suggested Student Activities

A. Writing specific information concerning opportunities in masonry and related occupations.
B. Visiting an office of the State Employment Service.
C. Listening to a speaker from a trade union.
D. Writing letters to correspondence and trade schools in order to determine opportunities for additional training.
E. Visiting a school for apprentices.
F. Visiting a construction site.
G. Watching movies of masonry and related occupations.
H. Reading the Occupational Outlook Handbook.

LEVEL II EXPERIENCES

SECOND YEAR PROGRAM

MASONRY EXPERIENCES - - LEVEL II

Unit I

Title: Preparation of Forms for Receiving Concrete in House Construction.

Objective: To develop in the individual the capability for preventing forms from spreading by the use of rods, wire, bolts, and braces and for installing footer and sidewalk forms.

Manual or Manipulative Learning:

A. Laying out square and angular lines with a framing square to an accuracy of 1/16 of an inch.
B. Cutting building material to length with a hand or power saw to an accuracy of 1/16 of an inch.
C. Nailing building material together with a hammer to an accuracy of 1/16 of an inch.
D. Tightening rods through the forms to an even tension with a wrench.
E. Drilling holes in forms with a power drill.
F. Removing bent nails with a bar or hammer.
G. Cutting wire to proper length with side cutting pliers.
H. Twisting wire in the form to the proper tension.
I. Tightening bolts to an even tension with a wrench.

Verbal Learning:

Communication:

A. Reading a blueprint to determine the spacing of rods, spreaders, wiring and bolts.
B. Reading a blueprint to determine the location of bracing and type of bracing recommended.
C. Reading a blueprint to determine the size and location of forms and the recommended method of installation.

Measurement:

A. Measuring building material with a folding ruler or steel tape to an accuracy of 1/16 of an inch.

Mathematics:

A. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

J. Sharpening stakes with a saw or axe.
K. Driving stakes with a sledge hammer.
L. Leveling forms with a level to an accuracy of 1/16 of an inch.
M. Bracing the bottoms of forms with earth.
N. Squaring a form by measuring the diagonals to an accuracy of 1/16 of an inch.
O. Cutting all stakes level with the top of the form in order to make screeding easy.

Science:

A. Explaining the pressure developed by concrete when poured in place.

General Information

A. Explaining the importance of keeping the top edge of a form free from obstruction.
B. Explaining the danger of cave-ins with unstable earth.
C. Demonstrating various types of effective bracing.
D. Demonstrating the proper use of an adjustable wrench.
E. Demonstrating safe use of a step ladder.
F. Using electric power tools safely.
G. Explaining the added precautions when using electric tools if the operator is in contact with the ground.
H. Wearing the appropriate safety apparel for the job.(glasses, shoes, helmets, gloves).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Cutting building material to length with a hand or power saw to an accuracy of 1/16 of an inch.
B. Installing rods and spreaders to space form sections.
C. Wiring and bolting forms to prevent spreading.
D. Calculating the pressure at the bottom of a form six feet high when filled with concrete.
E. Drawing sketch of effective bracing for a form 3 feet high showing the size and location of material.
F. Bracing the sidewalls of a three foot high form.
G. Cutting, sharpening and driving stakes.
H. Squaring forms by measuring the diagonals.
I. Setting a section of sidewalk form to receive concrete.
J. Installing a footer form to receive concrete.

MASONRY EXPERIENCES - - LEVEL II

Unit II

Title: Advanced Trowel Skills in House Construction

Objective: To develop in the individual the capability for finishing cement surfaces and laying concrete blocks.

Manual or Manipulative Learning:

A. Leveling the slab immediately after screeding with a bull float or darby.
B. Edging the slab after the surface water disappears with an edger.
C. Floating the surface of the slab with a float.
D. Troweling the surface of the slab with a steel trowel.
E. Finishing a slab with a broom finish if desired.
F. Cleaning up the tools following use with a steel brush and water.
G. Setting up a line with a hammer and nails or a corner block.
H. Cutting cement block with a hammer and chisel.
I. Laying a bed of mortar for the block with a trowel.
J. Throwing mortar on the end of the block with a trowel.
K. Laying the block in the wall.
L. Leveling the block to the line with the trowel handle or a mallet.

Verbal Learning:

Communication:

A. Reading a blueprint to determine the location, length, height and thickness of the wall.
B. Reading a blueprint to determine the finish called for on a slab.

Measurement:

A. Measuring the height of each course, the location of the wall and the total height of the wall with a folding ruler or a steel tape to an accuracy of 1/16 of an inch.

Mathematics:

A. Dividing the length of a wall by the length of one block to determine the number of blocks in one course.

M. Plumbing the block face to the previous course with a trowel handle or mallet using the eye or level as a guide.
N. Cleaning off excess mortar with a trowel.

General Information

A. Removing a mushroomed head from a cold chisel with a grinder.
B. Explaining how to determine when mortar is too wet or too dry.
C. Explaining why it is necessary to avoid "over hammering" the block to get it into position.
D. Explaining why it is necessary to "keep off" the line.
E. Explaining why concrete should not be overworked when it is plastic.
F. Demonstrating the safe use of a step ladder.
G. Wearing the appropriate safety apparel for the job (glasses, gloves, helmets, shoes).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Grinding a mushroomed head from a cold chisel.
B. Laying concrete block in a wall.
C. Figuring the number of concrete block in a wall of a given length and height.
D. Putting up a line for laying block.
E. Finishing a small concrete slab to provide utility and pleasing appearance.
F. Making two sample test blocks for observation, one that has been over-trowelled and one that has a minimum of trowelling.

MASONRY EXPERIENCES - - LEVEL II

Unit III

Title: Introductory Experiences in Brick Laying for House Construction

Objective: To develop in the individual the capability for recognizing the following bonds used in brick work: running, common, Flemish, English, basket weave.

Manual or Manipulative Learning:

A. Layout a running bond of four courses without mortar.
B. Layout a Flemish bond for an 8" wall of 7 courses without mortary
C. Layout an English bond for an 8" wall of 4 courses without mortar.
D. Layout a basket weave in a parallel panel for an 8" wall of 6 courses without mortar.
E. Layout a common bond for an 8" wall of 7 courses without mortar.
F. Cutting brick with a cold chisel.

Verbal Learning:

Communication:

A. Reading a blueprint to determine the type of bond specified.
B. Interpreting bond layout diagrams in order to layout the bond correctly.

General Information

A. Removing a mushroomed head from a cold chisel with a grinder.
B. Wearing the appropriate safety apparel on the job (glasses, shoes, helmets, gloves).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The ereection of full-scale or model units may assist in this process.

A. Cutting bricks with a chisel and hammer.
B. Drawing a sketch of each of the bonds in the lesson.
C. Laying up each of the bonds included in the lesson from memory.
D. Removing a mushroomed head from a cold chisel with a grinder.

Unit IV

Title: Occupational Information Pertaining to Masonry and Related Occupations.

Objective: To acquaint the individual with the opportunities in masonry and related occupations.

Occupational Information

Obtaining information about:

A. The employment outlook.
B. The wage scale.
C. The types of training available.
D. The working conditions experienced in the occupation.
E. The physical and mental characteristics needed for qualification for employment.
F. The geographical location of employment.
G. The opportunities for advancement.
H. The advantages and disadvantages of the occupation.
I. The nature of the work involved in the occupation.
J. The union involvement in the occupation.
K. The means of entry into the occupation.

Suggested Student Activities

A. Writing specific information concerning opportunities in masonry and related occupations.
B. Visiting an office of the State Employment Service.
C. Listening to a speaker from a trade union.
D. Writing letters to correspondence and trade schools in order to determine opportunities for additional training.
E. Visiting a school for apprentices.
F. Visiting a construction site.
G. Watching movies of masonry and related occupations.
H. Reading the Occupational Outlook Handbook.

INSTRUCTIONAL MATERIALS FOR MASONRY

TYPE	TITLE	DESCRIPTION	SOURCE
Book	Simplified Masonry Planning and Building by Ralph J. Dalzell	The text covers techniques and information of common types of concrete structures	McGraw-Hill Book Co.
Book	Concrete Technology	The text covers material and illustrations of concrete consturction	Portland Cement Association
Film	Brick and Stone Masonry	Film covers masons laying wall tile, face brick and face tile. 11 min.	Carl F. Mahnke Productions
Film	Concrete	Film shows methods of designing concrete mix. 30 min.	Charles Pacey
Film	Concrete Quality Control Tests	Film demonstrates care with which concrete is controlled	Charles Pacey
Film	Concrete Block Construction	Film shows relationship to building and construction	Mr. Wagner
Film	Concrete Example	Film shows mixing, placing, finishing and curing	Portland Cement Association
Film	Principles of Quality Concrete	Film shows making quality concrete	Portland Cement Association
Film	How to Transport, Place, Finish & Cure Quality Concrete	Film shows mixing, placing and special care for winter curing	Portland Cement Association

Slides	Mr. Quality Cement	40, 2 X 2 color slides for loan or $.25/slide	Portland Cement Association
Book Set	Bricklaying Vocational Training Instructors Guide Study Guide Student Textbook Trade Project	These books contain excellent illustrated material including evaluative material	Structural Clay Products Instituie

LEVEL I EXPERIENCES

FIRST YEAR PROGRAM

PAINTING EXPERIENCES - - LEVEL I

Unit I

Title: Preparation of Interior and Exterior Surfaces for a Finish for House Construction.

Objective: To develop in the individual the capability for removing old finishes and preparing a surface for the application of paint.

Manual or Manipulative Learning:

A. Removing loose paint with a wire brush or scraper.
B. Setting nails with a hammer and nail set punch.
C. Removing the hardware with a screwdriver.
D. Applying paint and varnish remover with a brush.
E. Removing paint and varnish remover with a scraper, putty knife, or coarse steel wool.
F. Applying a solution to neutralize the paint and varnish remover if called for by the manufacturer's instructions.
G. Sanding the surface with a power sander or by hand to the desired quality.
H. Applying filler to level the defects in the surface with a putty knife.

Verbal Learning:

Communication:

A. Reading the manufacturer's instructions on the paint container pertaining to the preparation of a surface and for use of paint and varnish remover.

Measurement:

A. Measuring the surface area (length X width) with a rule to an accuracy of the nearest foot.

Mathematics:

A. Multiplying to find the area of the surface.

I. Applying a cleaning solvent to galvanized iron prior to painting with a brush.
J. Removing grease, oil and wax with a commercial cleaner and a brush or clean cloth.
K. Applying an etching solution to concrete with a brush.
L. Applying a sealer to knots and materials which will "bleed" with a brush.
M. Applying a wood preservative to wood in contact with moisture using a brush.

Science:

A. Explaining how to handle chemicals safely.
B. Explaining the importance of grounding electric tools.

General Information

A. Protecting the owner's property with drop cloths when using paint and varnish remover.
B. Protecting oneself from paint and varnish remover that is irritable to the skin.
C. Explaining the clothing appropriate to use when working with various chemicals.
D. Explaining the various types and grades of sandpaper available.
E. Explaining the various types of sanding machines available.
F. Explaining the various types of paint remover and filler available.
G. Explaining the various types of sealers available for plaster, dry wall, new wood, and knots
H. Using a dust mask when sanding.
I. Explaining recommended primers for various surfaces.
J. Using a screwdriver safely.
K. Providing proper ventilation in the work area.
L. Selecting solvents for various finishing materials.
M. Explaining added precautions when using electric tools if operator is in contact with the ground.
N. Cleaning up the work area upon completion of the job.
O. Demonstrating safe use of step ladder.
P. Wearing the safety apparel appropriate to the job (glasses and gloves).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The application of finishes to full scale or model units may assist in this process.

A. Removing loose paint.
B. Setting loose nails.
C. Removing hardware before refinishing.
D. Applying paint and varnish remover.
E. Removing paint and varnish remover.
F. Applying a neutralizing solution.
G. Sanding a surface smooth.
H. Filling defects in the surface with filler.
I. Cleaning galvanized iron prior to finishing.
J. Removing grease, oil, and wax.
K. Applying an etching solution to concrete.
L. Applying a sealer to a surface.
M. Applying a wood preservative to a surface.
N. Measuring and calculating the area of a surface.
O. Placing drop cloths over furniture.
P. Drawing a chart of the various grades and types of sandpaper.

Unit II

Title: Preparation of Finishes and Applicators for Use in House Construction.

Objective: To develop in the individual the capability for preparing stain, clear finishes, paint, and applicators for use on the interior or exterior of a house.

Manual or Manipulative Learning:

A. Removing the lid of the can with a paint can opener.
B. Stirring paint, stain, and clear finishes with a paddle prior to using.
C. Mixing paint and finishing materials with a mechanical mixer, an electric drill, or by boxing it.
D. Thinning finishing material, stain, and paint with the proper solvent according to the manufacturer's instructions.
E. Adding dry powder or pigment to stain to make it darker.
F. Selecting the proper applicator (cloth, brush, or roller), size, and texture according to the size of the job and the finish desired.
G. Cleaning a brush by shaking out the solvent and wiping it dry.

Verbal Learning:

Communication:

A. Reading the manufacturer's directions on the can for mixing, thinning, preparation, and application.

General Information

A. Explaining the finishes that are suitable for interior and exterior use.
B. Explaining the various types of stains and their advantages and disadvantages.
C. Explaining thinners and solvents, suitable for various types of stains, paints, and finishes available on the market.
D. Cleaning an applicator prior to use with a vacuum cleaner.
E. Providing proper ventilation in the work area.
F. Cleaning up the work area upon completion of the job.
G. Using electric power tools safely.
H. Explaining added precautions when using electric tools if operator is in contact with the ground.
I. Wearing the safety apparel appropriate to the job (glasses).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The application of finishes to full scale or model units may assist in this process.

A. Stirring clear finishes, stain, and paint by hand.
B. Thinning finishes and stain with thinner.
C. Mixing paint by using a machine, or power drill, or by boxing it.
D. Selecting the proper applicator for a particular job.
E. Mixing pigment in a stain to darken it.
F. Preparing a clean applicator for applying stain.
G. Cleaning a brush.
H. Cleaning a roller.
I. Drawing a chart showing the various finishes and their advantages and disadvantages.

PAINTING EXPERIENCES - - LEVEL I

Unit III

Title: Cleaning and Storing Materials Following Use.

Objective: To develop in the individual the capability for cleaning and storing brushes and rollers.

Manual or Manipulative Learning:

A. Cleaning the rim of the container free of finishing material.
B. Sealing the lid of the can with a hammer.
C. Cleaning the hard paint from the bristles near ferrule with a wire brush.
D. Washing a brush or roller in thinner.
E. Removing the excess thinner from a brush or a roller by working it out on scrap wood or paper or by "whipping" it out.
F. Washing the thinner from a brush or roller with soap and water.
G. Storing brushes wrapped in paper to keep the bristles straight.
H. Softening the hardened bristles with a commercial preparation.

Verbal Learning:

Communication:

A. Reading the manufacturer's instructions on a can of finish to determine the proper solvent.

General Information

A. Demonstrating how to store wet brushes.
B. Providing proper ventilation in the work area.
C. Selecting solvents for various finishing materials.
D. Cleaning up the work area upon completion of the job.
E. Wearing the safety apparel appropriate to the job (glasses and gloves).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The application of finishes to full scale or model units may assist in this process.

A. Cleaning and sealing the lid of a can of finishing material.
B. Cleaning the hardened paint from a brush.
C. Washing a brush or roller in thinner.
D. Washing the thinner from a brush or roller.
E. Working out the excess finishing material or thinner.
F. Softening the hardened bristles of a brush.
G. Storing a brush or roller.

Unit IV

Title: Occupational Information Pertaining to Painting and Related Occupations.

Objective: To acquaint the individual with the opportunities in painting and related occupations.

Occupational Information

Obtaining information about:

A. The employment outlook.
B. The wage scale.
C. The types of training available.
D. The working conditions experienced in the occupation.
E. The physical and mental characteristics needed for qualification for employment.
F. The geographical location of employment.
G. The opportunities for advancement.
H. The advantages and disadvantages of the occupation.
I. The nature of the work involved in the occupation.
J. The union involvement in the occupation.
K. The means of entry into the occupation.

Suggested Student Activities

A. Writing specific information concerning opportunities in painting and related occupations.
B. Visiting an office of the State Employment Service.
C. Listening to a speaker from a trade union.
D. Writing letters to correspondence and trade schools in order to determine opportunities for additional training.
E. Visiting a school for apprentices.
F. Visiting a construction site.
G. Watching movies of painting and related occupations.
H. Reading the Occupational Outlook Handbook.

LEVEL II EXPERIENCES

SECOND YEAR PROGRAM

PAINTING EXPERIENCES - - LEVEL II

Unit I

Title: Preparation of Interior and Exterior Surfaces for a Finish for a House.

Objective: To develop in the individual the capability for preparing an exterior or interior surface for the application of stain or a clear finish.

Manual or Manipulative Learning:

A. Setting nails with a hammer and a nail set.
B. Removing hardware with a screwdriver prior to finishing.
C. Sanding the surface by hand or by machine to the desired smoothness.
D. Raising the grain of wood with water.
E. Applying wood filler to defects or to open grained wood.
F. Cleaning the surface of sanding dust with a cloth, vacuum cleaner or tack rag.

Verbal Learning:

Science:

A. Explaining the importance of grounding electric tools.

General Information

A. Explaining the various grades of sandpaper available.
B. Explaining how to check wood to see if it is ready for stain.
C. Explaining the various types of sanders available.
D. Using a dust mask when sanding.
E. Explaining the various types of fillers available.
F. Using a screwdriver safely.

G. Using various types of power sanders correctly.
H. Explaining added precautions when using electric tools if operator is in contact with the ground.
I. Inspecting the surface to determine the readiness for a clear finish.
J. Selecting a dust free location for applying a finish.
K. Demonstrating safe use of step and extension ladders.
L. Cleaning up the work area upon completion of the job.
M. Wearing the safety apparel appropriate to the job (glasses).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The application of finishes to full scale or model units may assist in this process.

A. Setting loose nails.
B. Removing hardware before preparation.
C. Sanding a surface smooth.
D. Raising the grain of wood.
E. Removing grease and oil stains.
F. Applying wood filler.
G. Cleaning the sanding dust from a surface.
H. Listing the various types of sanders and their uses.
I. Inspecting a surface to determine its fitness for a finish.

PAINTING EXPERIENCES - - LEVEL II

Unit II

Title: Advanced Procedures in Preparation for and Application of Finishes for a House.

Objective: To develop in the individual the capability for preparing joints and nail holes in dry wall, glazing a window, and applying finishing materials to surfaces on a house.

Manual or Manipulative Learning:

A. Countersinking any nail heads that stick above the paper with a round headed hammer.
B. Covering the nail heads or a joint with cement with a broad putty knife.
C. Applying the perforated tape in the cement with a broad putty knife.
D. Applying a layer of cement over the tape with a curved trowel.
E. Sanding the nail heads and joints when the cement is dry with an orbital sander.
F. Applying topping cement to nail heads and joints with a broad putty knife or a curved trowel.
G. Removing putty with a putty softener and a putty knife.
H. Removing the glazing points with a putty knife.
I. Removing the glass from the opening with a hammer, pliers, and a chisel.

Verbal Learning:

Communication:

A. Reading the manufacturer's instructions pertinent to the application of paint, mixing of the cement, and application of the glazing compound.

Measurement:

A. Measuring and calculating the surface areas with a rule to an accuracy of 1/16 of an inch.
B. Measuring the thickness of the glass with a ruler to an accuracy of 1/32 of an inch.
C. Dividing gallons into units as small as half pints.

J. Removing the backing putty from the sash with a putty knife.
K. Removing the lid of a can with a paint can opener.
L. Preparing the glazing compound by kneading in the hand.
M. Applying glazing compound to the sash by hand for bedding the glass.
N. Installing the glass in the opening and bedding it in the glazing compound.
O. Installing glazing points with a hammer.
P. Glazing the window with a putty knife.
Q. Removing the surplus putty from around the glass.
R. Removing hardware with a screwdriver prior to painting.
S. Applying paint with a brush or a roller.

Mathematics:

A. Multiplying and dividing to find the surface area and the amount of finish needed.

General Information

A. Explaining the thickness of glass obtainable.
B. Explaining the safe use of putty softener.
C. Cleaning hands and tools following the installation of glass.
D. Explaining the various grades of sandpaper available.
E. Using a mask when sanding.
F. Explaining special purpose trowels available.
G. Selecting solvents for various finishing materials.
H. Explaining the importance of using a step by step procedure in painting.
I. Explaining the effect of humidity and temperature level on the drying time.
J. Explaining the use of primers on new work.
K. Providing proper ventilation for safe working conditions.
L. Protecting surfaces and objects not to be painted with a drop cloth or masking.
M. Cleaning up the work area upon completion of the job.

N. Demonstrating safe use of step and extension ladders.
O. Explaining added precautions when using electric tools if operator is in contact with the ground.
P. Wearing the safety apparel appropriate to the job (glasses, shoes, helmets, gloves).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The application of finishes to full scale or model units may assist in this process.

A. Countersinking nails.
B. Covering nail heads and joints with cement and tape.
C. Sanding the cured cement.
D. Applying the topping cement.
E. Removing putty from a sash.
F. Removing glazing points.
G. Removing glass from a sash.
H. Preparing glazing compound.
I. Applying glazing compound to a sash.
J. Installing the glass in a sash.
K. Installing glazing points in a sash.
L. Removing the surplus putty.
M. Removing hardware before preparation of a surface.
N. Applying paint.
O. Calculating the area to be painted.

PAINTING EXPERIENCES - - LEVEL II

Unit III

Title: Occupational Information Pertaining to Painting and Related Occupations.

Objective: To acquaint the individual with the opportunities in painting and related occupations.

Occupational Information

Obtaining information about:

A. The employment outlook.
B. The wage scale.
C. The types of training available.
D. The working conditions experienced in the occupation.
E. The physical and mental characteristics needed for qualification for employment.
F. The geographical location of employment.
G. The opportunities for advancement.
H. The advantages and disadvantages of the occupation.
I. The nature of the work involved in the occupation.
J. The union involvement in the occupation.
K. The means of entry into the occupation.

Suggested Student Activities

A. Writing specific information concerning opportunities in painting and related occupations.
B. Visiting an office of the State Employment Service.
C. Listening to a speaker from a trade union.
D. Writing letters to correspondence and trade schools in order to determine opportunities for additional training.
E. Visiting a school for apprentices.
F. Visiting a construction site.
G. Watching movies of painting and related occupations.
H. Reading the Occupational Outlook Handbook.

INSTRUCTIONAL MATERIALS FOR PAINTING

TYPE	TITLE	DESCRIPTION	SOURCE
Book	*Painting and Decorating Encyclopedia* by William Brushwell	The text covers practical knowledge on painting and decorating	Goodheart-Willcox Co.
Book	*Painting and Decorating* by Walter Chlystyk	A how-to-do-it book	McGraw-Hill Book Co.
Pamphlet	Painting by David Jones	Pamphlet covers the application of colors	International Correspondence School
Pamphlet	A History of Paint and Color	Pamphlet covers the history of paint and color	Pittsburgh Plate Glass Co.
Pamphlet	Color Dynamics	Pamphlet covers the scientific utilization of the energy in color	Pittsburgh Plate Glass Co.
Pamphlet	Indoor Painting	Pamphlet covers a how-to-do it process of interior painting	National Paint, Varnish and Lacquer Association
Pamphlet	Outdoor Painting	Pamphlet covers outdoor painting data	National Paint, Varnish and Lacquer Association
Pamphlet	Reflectivity of Aluminum Pigments and Paint	Pamphlet is a two part reprint from "Paint, Oil & Chemical Review"	Reynolds Metals Co.

LEVEL I EXPERIENCES

FIRST YEAR PROGRAM

PLUMBING EXPERIENCES - - LEVEL I

Unit I

Title: Excavation of Earth by Hand for House Construction.

Objective: To develop in the individual the capability for digging a trench, backfilling a trench, and laying a drainage field by hand.

Manual or Manipulative Learning:

A. Removing the lawn sod from the excavation area with a sod cutter or a shovel.
B. Loosening the soil with a pick prior to the removal from the excavation area.
C. Removing the soil from the excavation area with a shovel.
D. Leveling the bottom of the excavating area with a shovel and checking it with a level, rule, and blocks to an accuracy of 1/4 of an inch in 8 feet.
E. Placing coarse gravel or crushed stone over the bottom of the excavation with a shovel, grading it with a shovel or hoe, and checking it with a level, rule, and blocks to an accuracy of 1/4 of an inch in 8 feet.
F. Laying pipe or drainage tile on top of the graded stone by hand leaving a gap of 1/4 of an inch.

Verbal Learning:

Communication:

A. Reading a blueprint to determine the depth below grade for the excavation area, the grade of the bottom, and the prescribed method of laying the pipe or tile.

Measurement:

A. Measuring the grade of the bottom of the excavation area, the pipe or the tile to an accuracy of 1/4 of an inch.

Mathematics:

A. Calculating the total grade for a given distance when the grade per unit is given.

G. Covering the joints and gaps of the pipe or tile with tar paper and placing coarse gravel or crushed stone over the pipe or tile with a shovel to the required depth.
H. Covering the coarse gravel or crushed stone with tar paper or other suitable material.
I. Bedding pipe or tile with soil using a shovel.
J. Filling the excavation area with soil and packing the loose soil with a tamper or with water.
K. Replacing the sod by hand and tamping it with a tamper and with water.
L. Cleaning up the lawn around the excavation area with a rake.

General Information

A. Working at a moderate rate of speed.
B. Preserving the removed sod so it can be reused.
C. Placing the excavated soil in an accessable location.
D. Explaining the reasoning behind maintaining the proper grade during the excavating process.
E. Wearing the safety apparel appropriate to the job (shoes, gloves, and helmets).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The excavation and placement of pipe or tile on a full-scale or mock-up basis may assist in this process.

A. Removing sod from a lawn; to include cutting and rolling.
B. Replacing sod over the excavation area; to include tamping and watering.
C. Digging a trench and grading the bottom to the specifications. found by reading a blueprint.
D. Placing crushed stone or coarse gravel in an excavation area and grading it to an accuracy of 1/4 of an inch in 8 feet.
E. Placing pipe or tile in a trench checking the grade to an accuracy of 1/4 of an inch in 8 feet.
F. Bedding a length of pipe or tile in a trench.
G. Covering the joints of the pipe or tile with tar paper.
H. Replacing the excavated soil and repacking it.
I. Cleaning up the excavation site.
J. Calculating the grade per unit when the total grade variation is given.
K. Drawing a sketch showing the depth of stone or gravel and placement of the pipe or tile.
L. Drawing a sketch and calculating the grade check points along the total distance of the excavation.

PLUMBING EXPERIENCES - - LEVEL I

Unit II

Title: Preparing Pipe and Tubing for Installation in House Construction.

Objective: To develop in the individual the capability for preparing copper tubing, iron pipe, iron soil pipe, and lead for pouring.

Manual or Manipulative Learning:

A. Holding pipe or tubing in a vise for cutting, reaming, or threading.
B. Cutting pipe, soil pipe, or tubing to length with the appropriate tools (hacksaw, tubing cutter, hammer, cold chisel, or machine) to an accuracy of 1/8 of an inch.
C. Cutting lead with a hammer and cold chisel for melting.
D. Reaming pipe or tubing with a hand or machine reamer to remove burrs.
E. Cutting pipe threads with a hand or machine threader using cutting oil.
F. Changing the die sizes on hand or machine thread cutters.
G. Preparing and lighting the furnace.
H. Adding lead to the molten lead.
I. Preparing oakum for packing or yarning the joint.
J. Positioning and maintaining the pipe in alignment before and during yarning.

Verbal Learning:

Communication:

A. Reading a blueprint to determine the length of stock required.
B. Reading the manufacturer's instructions for lighting the furnace.

Measurement:

A. Measuring the stock to length with a ruler to an accuracy of 1/8 of an inch.
B. Measuring the total length of stock and fittings with a ruler or tape to an accuracy of 1/8 of an inch.

Mathematics:

A. Adding, subtracting, multiplying and dividing in order to economically cut the stock to the correct length.

K. Yarning oakum in the joint with a hammer and a yarning iron.
L. Placing the pipe in a vertical position or attaching an asbestos gasket to the soil pipe for a horizontal position in preparation for pouring lead.
M. Cleaning the pipe, tubing, or soil pipe with a clean cloth, steel wool, or emery cloth.

Science:

A. Explaining the importance of grounding electrical equipment

General Information

A. Explaining the different types of furnaces likely to be found on a job.
B. Explaining the reason for removing mushroomed heads from a cold chisel and yarning iron with a grinder.
C. Ventilating the area around the furnace.
D. Explaining the reason for keeping moisture away from the molten metal.
E. Cutting pipe, soil pipe and tubing square in order to make a good joint.
F. Cutting threads to the proper length.
G. Cleaning the cutting, reaming, and threading tools with a cloth.
H. Wearing the safety apparel appropriate to the job (glasses, shoes, helmets, and gloves).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Clamping pipe or tubing into a vise.
B. Cutting a piece of pipe or tubing to a given length to an accuracy of 1/8 of an inch.
C. Cutting the lead to melt in the pot.
D. Reaming a piece of pipe or tubing.
E. Cutting threads on a piece of pipe.
F. Changing the dies on hand or power thread cutters.
G. Lighting a furnace and adding lead to the molten metal.
H. Aligning soil pipe for joining.
I. Yarning oakum in a joint.
J. Pouring molten lead into a joint.
K. Squaring the ends of pipe or tubing for a correct fit.
L. Cutting stock so that left over pieces are at a minimum.
M. Grinding the mushroomed head of a cold chisel or yarning iron.
N. Cleaning tools after use.
O. Calculating the length of a piece of stock from an overall dimension on a blueprint.

PLUMBING EXPERIENCES - - LEVEL I

Unit III

Title: Assembling and Installation of Furnaces and Duct Work for House Construction.

Objective: To develop in the individual the capability for assembling furnaces and installing duct work.

Manual or Manipulative Learning:

A. Removing crating material or bent nails without damage to the contents with a claw hammer and a pry bar.
B. Assembling sections of the furnace, placing lock washers on properly, with a screwdriver and pliers.
C. Drilling holes in sheet metal for bolts and screws by hand or with an electric drill.
D. Mixing fire clay with a trowel for laying up fire brick.
E. Leveling the furnace unit with a level and shims.
F. Forming sheet metal hangers for duct work with shears, bar folder, brake or improvised bending equipment.
G. Attaching hangers to framing members with a hammer.
H. Assembling seams of prefabricated duct work.

Verbal Learning:

Communication:

A. Reading a blueprint or a manufacturer's directions to determine the proper location and assembly procedures

Measurement:

A. Measuring sheet metal to size with a ruler to an accuracy of 1/16 of an inch.

I. Fastening sheet metal together with screws and a screwdriver.
J. Cutting sheet metal to size to an accuracy of 1/16 of an inch with straight snips or aviation snips.
K. Making seams in sheet metal using hand methods.

General Information

A. Using a screwdriver safely.
B. Using electrical power tools safely especially when the operator is in contact with the ground.
C. Demonstrating the safe use of a step ladder.
D. Using soft faced tools for shaping or forming sheet metal.
E. Cleaning up the work area after finishing the job.
F. Wearing the safety apparel appropriate to the job (glasses, shoes, helmets, and gloves).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Removing the crating from a furnace unit.
B. Removing bent nails from a piece of wood.
C. Drilling holes in a piece of sheet metal.
D. Measuring and cutting a piece of sheet metal to a given size to an accuracy of 1/16 of an inch.
E. Making a section of duct work by hand.
F. Assembling a furnace.
G. Assembling a prefabricated section of duct work.
H. Attaching hangers to a piece of a heavy framing member.
I. Leveling a furnace.
J. Mixing a batch of fire clay.
K. Drawing a sketch showing a section of the furnace.
L. Drawing a sketch showing the details of various sheet metal joints.

PLUMBING EXPERIENCES - - LEVEL I

Unit IV

Title: Preparation of Plumbing Fixtures for Installation in House Construction.

Objective: To develop in the individual the capability for attaching mounting brackets for plumbing fixtures to frame and masonry construction in a house.

Manual or Manipulative Learning:

A. Squaring cuts with a framing square to an accuracy of 1/16 of an inch.
B. Cutting backing blocks with power saws or a hand saw to an accuracy of 1/16 of an inch.
C. Nailing backing blocks in place with a claw hammer using a proper nailing pattern to an accuracy of 1/16 of an inch.
D. Drilling pilot holes with a hand drill or an electric drill for wood screws.
E. Drilling holes for fasteners with an electric drill or with a star drill and a hammer.
F. Driving fastening devices with an impact tool.
G. Attaching mounting brackets in a level position with a level and a screwdriver.
H. Removing bent nails with a bar or a hammer.

Verbal Learning:

Communication:

A. Reading a blueprint to determine the proper location of the plumbing fixtures.
B. Reading manufacturer's instructions to obtain the proper hole sizes for the fastener to be used

Measurement:

A. Measuring to find the location of hangers and center points using two directional measurements within an accuracy of 1/16 of an inch.
B. Measuring backing blocks to length with a ruler to an accuracy of 1/16 of an inch.

General Information

A. Selecting types of fasteners that best fit the requirements of the job.
B. Explaining advantages and disadvantages of various available fasteners.
C. Locating framing members in an existing wall.
D. Explaining the method of installing each type of fastener.
E. Using an adjustable wrench properly.
F. Using a screwdriver safely.
G. Using electric power tools safely.
H. Explaining added precautions when using electric tools if operator is in contact with the ground.
I. Wearing the safety apparel appropriate to the job (glasses, gloves).

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Measuring, squaring and cutting backing blocks to length to an accuracy of 1/16 of an inch.
B. Nailing blocks into place.
C. Drilling pilot holes.
D. Drilling holes in masonry.
E. Driving fastening devices into masonry.
F. Attaching mounting brackets in a level position on the backing blocks.
G. Cutting stock so that left over pieces are kept to a minimum.
H. Drawing a sketch of the location of the backing blocks and mounting brackets determined by reading the blueprint.

PLUMBING EXPERIENCES - - LEVEL I

Unit V

Title: Occupational Information Pertaining to Plumbing and Related Occupations.

Objective: To acquaint the individual with the opportunities in plumbing and related occupations.

Occupational Information

Obtaining information about:

A. The employment outlook.
B. The wage scale.
C. The types of training available.
D. The working conditions experienced in the occupation.
E. The physical and mental characteristics needed for qualification for employment.
F. The geographical location of employment.
G. The opportunities for advancement.
H. The advantages and disadvantages of the occupation.
I. The nature of the work involved in the occupation.
J. The union involvement in the occupation.
K. The means of entry into the occupation.

Suggested Student Activities

A. Writing specific information concerning opportunities in plumbing and related occupations.
B. Visiting an office of the State Employment Service.
C. Listening to a speaker from a trade union.
D. Writing letters to correspondence and trade schools in order to determine opportunities for additional training.
E. Visiting a school for apprentices.
F. Visiting a construction site.
G. Watching movies of plumbing and related occupations.
H. Reading the Occupational Outlook Handbook.

LEVEL II EXPERIENCES

SECOND YEAR PROGRAM

PLUMBING EXPERIENCES - - LEVEL II

Unit I

Title: Service Operations for Plumbing Installations in a House.

Objective: To develop in the individual the capability for installing a water closet seat, repairing leaks in faucets and water closets, and cleaning waste lines.

Manual or Manipulative Learning:

A. Removing, replacing, reassembling, adjusting, connecting, or disconnecting an old or new water closet seat, a faucet assembly, a swing faucet, a packing nut, a clean out plug, or a trap with an adjustable wrench.
B. Removing, replacing, or adjusting a faucet handle, a faucet assembly or a tank ball with a screwdriver.
C. Using wrenches, screwdrivers, and pliers without marring porcelain or chrome-plated surfaces.
D. Cleaning the area around the seat mounting holes of a water closet with scouring powder prior to installation of a new seat.
E. Installing a new seat with soft washers in the proper location.
F. Adjusting a new seat to line up and place it in balance.
G. Shutting off the water supply by hand.

Verbal Learning:

Communication:

A. Reading the manufacturer's directions for installation and repair of parts.
B. Reading a blueprint to locate clean out plugs in a waste line.

Measurement:

A. Measuring the center to center distances to an accuracy of 1/16 of an inch.
B. Measuring the size of a washer with a ruler to an accuracy of 1/32 of an inch.

Science:

A. Exercising personal hygiene following completion of the job.

H. Turning the faucet handle to the "on" position.
I. Replacing the packing around the faucet stem if necessary.
J. Replacing the faucet washer.
K. Adjusting the tank flush valve to prevent leaking.
L. Adjusting the tank lever action to achieve a smooth action.
M. Replacing and adjusting a tank ball in a water closet.
N. Adjusting the float to change the water storage level.
O. Cleaning out a trap from the clean out hole with a wire.
P. Cleaning a waste line from a sink or lavatory with a snake.
Q. Cleaning out a soil pipe line with a snake.
R. Cleaning a snake following use with a cloth.
S. Oiling a snake following use to prevent rust.
T. Replacing the gaskets on traps and clean-out plugs.

General Information

A. Protecting the household property of the owner from damage.
B. Cleaning up the work area upon completion of the job.
C. Using a screwdriver safely.
D. Protecting porcelain and polished surfaces from damage with tools.
E. Tightening traps and cleanout plugs snugly without undue force.
F. Recognizing various types of snakes available for cleaning out waste lines.
G. Using a faucet properly to preserve the washer life.

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Adjusting a float valve for the proper storage level.
B. Adjusting a tank flush valve.
C. Adjusting the tank level action.
D. Replacing a tank ball in a water closet.
E. Removing and replacing a clean-out plug.
F. Cleaning out a trap.
G. Disconnecting and reconnecting a trap.
H. Cleaning out a waste line from a sink or lavatory.
I. Cleaning out a soil pipe line.
J. Cleaning and oiling a soiled snake following use.
K. Replacing a gasket on a trap and clean-out plug.
L. Removing and replacing a faucet handle and a faucet assembly.
M. Replacing the packing around a faucet stem.
N. Adjusting a packing nut.
O. Disassembling and reassembling a swing faucet.
P. Replacing a washer on a swing faucet.
Q. Removing an old water closet seat.
R. Installing a new water closet seat.
S. Cleaning a water closet around the seat mounting holes.
T. Adjusting a new water closet seat.

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Unit II

Title: Welding and Soldering of Plumbing Installations for a House.

Objective: To develop in the individual the capability for welding iron pipe hangers and soldering sheet metal and copper tubing.

Manual or Manipulative Learning:

A. Cleaning the metal preparatory to soldering with a file, emery-cloth, or steel wool.
B. Tinning a surface with a soldering copper or other device.
C. Soldering with a flame or soldering copper.
D. Cleaning the excess solder from the material with a cloth.
E. Sweating two pieces of metal together with soldering equipment.
F. Tacking sheet metal prior to soldering.
G. Setting up welding equipment with a wrench preparatory to welding.
H. Turning the gas on and off with a regulator at the beginning and end of the operation using the proper procedure.
I. Lighting a torch correctly with a sparker.

Verbal Learning:

Communication:

A. Interpreting solder and fluxing compositions from the manufacturer's specifications.
B. Reading the manufacturer's instructions for assembling gas welding equipment.

Measurement:

A. Measuring the length of a hanger with a ruler to an accuracy of 1/8 of an inch.

Science:

A. Explaining the composition of solder.
B. Protecting L.P. soldering and gas welding equipment from contact with oil.

J. Adjusting the flame to neutral.
K. Laying a bead with a welding rod and a torch.
L. Cleaning a bead with a chipping hammer and a wire brush.

C. Explaining the need for a fluxing action.
D. Explaining the precautions to take when using an acid flux.
E. Explaining the basic principles of welding metal.

General Information

A. Wearing the safety apparel appropriate to the job (glasses, shoes, helmets, gloves).
B. Demonstrating safe use of extension ladder.
C. Using various sorts of heat for soldering.
D. Using proper fluxes for various metals.
E. Handling a L. P. torch and accessories with care.
F. Protecting oneself and others from hot metal.
G. Selecting the proper welding rod for the job.
H. Protecting the rubber tubing when welding.
I. Ventilating the area to provide a safe working condition.

Suggested Student Activities

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Cleaning the metal before using.
B. Tinning a surface.
C. Soldering joints of copper tubing and sheet metal.
D. Cleaning off the excess solder.
E. Sweating two pieces of metal together.
F. Tacking two pieces together.
G. Setting up and shutting down welding equipment.
H. Turning the gas on and off.
I. Lighting the flame and adjusting it.
J. Welding a bead.
K. Cleaning a bead after welding.
L. Making up a table of solders, fluxes, and metals showing their

PLUMBING EXPERIENCES - - LEVEL II

Unit III

Title: Installation of Plastic Pipe and Insulation of Heating and Water Lines for a House

Objective: To develop in the individual the capability for insulating heating and water lines and for installing plastic water lines for a house.

Manual or Manipulative Learning:

A. Cutting stock to length with a knife or fine saw to an accuracy of 1/8 of an inch.
B. Softening pipe in hot water prior to installation.
C. Attaching the required fittings in place with a screwdriver or by press fitting.
D. Fastening pipe in place with pipe hangers.
E. Attaching insulation to pipe lines with metal bands by hand.
F. Mixing the asbestos cement for fittings with a trowel.
G. Applying the asbestos cement around the fittings by hand.
H. Wrapping the asbestos cement with a cloth to hold it in position.

Verbal Learning:

Communication:

A. Reading a blueprint to determine the length of pipe, the placement of the fittings, the location of installation, and the pipe lines to be insulated.
B. Reading the manufacturer's instructions for insulation.

Measurement:

A. Measuring the length of pipe and the insulation with a rule to an accuracy of 1/8 of an inch.

Mathematics:

A. Adding, subtracting, multiplying, dividing in order to economically cut stock to correct lengths.

General Information

A. Using plastic pipe only in places and for uses for which it was intended.
B. Using a screwdriver safely.
C. Demonstrating safe use of step ladder.
D. Wearing the safety apparel appropriate to the job (glasses, shoes, helmets, gloves).

Suggested Student Activites

All student activities should be made as practical and meaningful as possible. The erection of full-scale or model units may assist in this process.

A. Measuring and cutting a length of pipe to an accuracy of 1/8 of an inch.
B. Softening a length of plastic pipe.
C. Attaching various fittings to plastic pipe.
D. Fastening plastic pipe in place.
E. Measuring and cutting a piece of insulation to length to an accuracy of 1/8 of an inch.
F. Attaching a piece of insulation to a pipe.
G. Mixing a batch of asbestos cement.
H. Applying asbestos cement.
I. Wrapping a length of insulated pipe with a cloth.
J. Drawing a table of plastic pipe uses.
K. Calculating the length of pipe from a blueprint.
L. Calculating the total amount of insulation needed for the job.

PLUMBING EXPERIENCES - - LEVEL II

Unit IV

Title: Occupational Information Pertaining to Plumbing and Related Occupations.

Objective: To acquaint the individual with the opportunities in plumbing and related occupations.

Occupational Information

Obtaining information about:

A. The employment outlook.
B. The wage scale.
C. The types of training available.
D. The working conditions experienced in the occupation.
E. The physical and mental characteristics needed for qualification for employment.
F. The geographical location of employment.
G. The opportunities for advancement.
H. The advantages and disadvantages of the occupation.
I. The nature of the work involved in the occupation.
J. The union involvement in the occupation.
K. The means of entry into the occupation.

Suggested Student Activities

A. Writing specific information concerning opportunities in plumbing and related occupations.
B. Visiting an office of the State Employment Service.
C. Listening to a speaker from a trade union.
D. Writing letters to correspondence and trade schools in order to determine opportunities for additional training.
E. Visiting a school for apprentices.
F. Visiting a construction site.
G. Watching movies of plumbing and related occupations.
H. Reading the Occupational Outlook Handbook.

INSTRUCTIONAL MATERIALS FOR PLUMBING

TYPE	TITLE	DESCRIPTION	SOURCE
Book	Plumbing by Harold E. Babbitt	The text covers modern plumbing practices	McGraw-Hill Book Co.
Book	How to Design and Install Plumbing by A.J. Matthias, Jr. and E. Smith, Sr.	The text covers practices in plumbing design and installation	American Technical Society
Book	National Plumbing Code	The text covers the required practices in the plumbing trade	Monas Publications
Book	Course in Plumbing and Pipe Fitting	The workbook is for apprentices, includes related information and test sheets	California State Department of Education
Book	Copper Tube Handbook	The text covers procedures in the use of copper tubing	Copper and Brass Research Association
Film	Plumbing	Film shows roughing-in water pipes in walls and floors of a building	Carl F. Mahnke Productions
Film	Plumbing	Flim shows opportunities in the plumbing trades	Vocational Guidance Films
Film	Cutting and Threading Pipe by Hand	Film shows a step-by-step procedures of threading pipe by hand	National Association of Plumbing Contractors

Film	Cutting and Threading Pipe on a Power Machine	Film shows proper use of the machine cutter and threader including safe practices	National Association of Plumbing Contractors
Film	Laying Out and Installing Hangers	Film shows methods of locating and erecting pipe hangers in support of an acceptable piping system	National Association of Plumbing Contractors
Film	Measuring Pipe, Tube and Fittings	Film shows making the proper allowances for fitting in order to determine pipe and tubing length accurately	National Association of Plumbing Contractors
Film	Plumbing-Your Life's Work	Film covers working conditions, physical and mental characteristics needed, opportunities for advancement and nature of work involved	National Association of Plumbing Contractors
Film	Toward a Uniform Plumbing Code	Film shows a treatment of the reasoning behind the movement for a uniform plumbing code	National Association of Plumbing Contractors
Film	Piping Pointers	Film shows the most common faults in installation of piping with ways of making any installation easier	National Association of Plumbing Contractors
Film	The Rural Water System	Film shows special treatment of plumbing installations as it applies to rural areas	National Association of Plumbing Contractors

SOURCES FOR INSTRUCTIONAL MATERIALS

This section of the report provides the addresses for the instructional materials listed at the end of each occupational area.

SOURCES FOR INSTRUCTIONAL MATERIALS

Arizona State University
Encyclopaedia Britannica Films
Tempe, Arizona

Black and Decker
Manufacturing Company
Towson 4, Maryland

California State Department
of Education
Sacramento, California

Carl F. Mahnke Productions
215 E. 3rd St.
Des Moines, Iowa

Charles Pacey
3601 London Lane
Fort Worth, Texas

Copper and Brass Research
Association
420 Lexington Avenue
New York 17, New York

Goodheart-Willcox Company,Inc.
Homewood, Illinois

International Textbook Company
Scranton, Pennsylvania

Jam Handy
281 E. Grand Blvd.
Detroit 11, Michigan

Long Filmslide Service
944 Riegal Rd.
Berkeley, California

McGraw-Hill Book Company, Inc.
New York, New York

Modern Talking Picture
Service
3 E. 54th St.
New York 22, New York

Monas Publications
4513 Potomac Ave., N.W.
Washington 7, D.C.

National Paint Varnish &
Lacquer Association
1500 Rhode Island Ave., N.W.
Washington 5, D.C.

National Association of
Plumbing Contractors
1016 20th St., N.W.
Washington, D.C.

Pittsburgh Plate Glass Co.
Pittsburgh 22, Pennsylvania

Portland Cement Association
33 W. Grand Ave.
Chicago, Illinois

Reynolds Metals Company
P.O. Box 2346
Richmond 18, Virginia

Roger Duhamel, F.R.S.C.
Queen's Printer & Controller
of Stationery
Ottawa, Canada

Southern Pine Association
P.O. Box 1170
New Orleans, Louisiana

Stanley Tools
47 D Elm St.
New Britain, Connecticut

Structural Clay Products
Institute
1520 18th St., N.W.
Washington, D.C., 20036

United Brotherhood of Carpenters
and Joiners of America
101 Constitution Ave., N.W.
Washington, D.C., 2001

U.S. Gypsum
221 E. Camelback Rd.
Phoenix, Arizona

United World Films, Inc.
605 W. Washington Building
Chicago 6, Illinois

Vocational Guidance Films
Des Moines, Iowa

Mr. Wagner
4012 N. Central Ave.
Phoenix, Arizona

Westinghouse Corporation
School Service
P.O. Box 1017
Pittsburgh 30, Pennsylvania